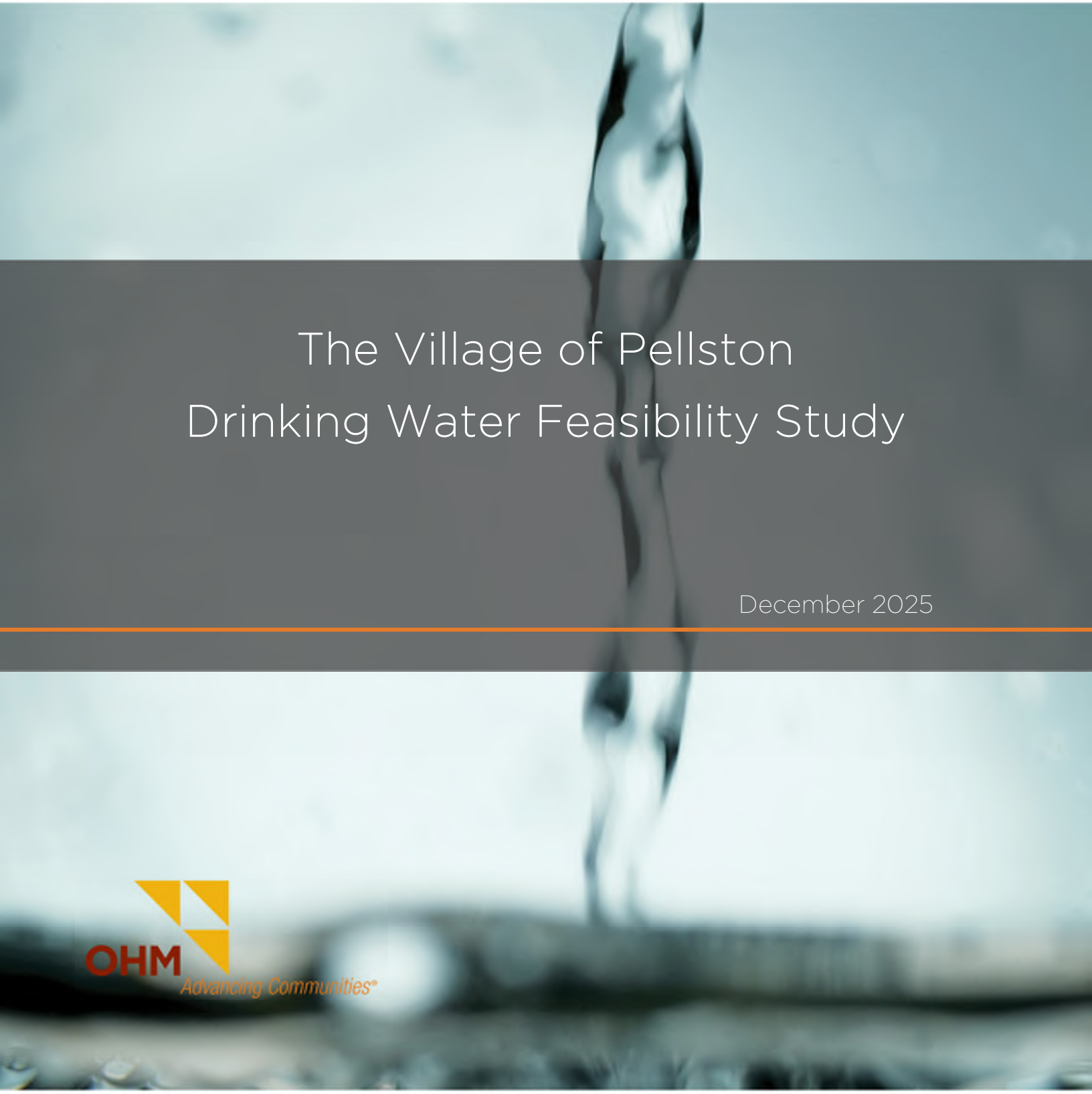

The Village of Pellston
Drinking Water Feasibility Study

December 2025

OHM
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EXECUTIVE SUMMARY

This feasibility study for the Village of Pellston Drinking Water Supply addresses the issue of PFAS contamination in 158 residential wells within the Village and the need for a long-term, stable solution to the problem.

When PFAS contamination was discovered in residential wells, the initial solution was to provide Point of Use (POU) filters to the affected residences. However, due to the drawbacks (including low flow rate and concerns about filter replacement and bypass), this is viewed as a temporary solution until a permanent solution can be implemented.

In order to provide a more secure long-term solution, three alternatives were identified:

1. Point of Entry (POE) filters
2. Public Water System via Local Municipal Source
3. Public Water System via Regional Wholesale Provider

In order to evaluate Option 1: Point of Entry or whole house filters, a cost estimate was produced for initial installation and yearly maintenance based on information from a local supplier and comparison with a similar project nearby. This alternative is estimated to cost $1,341,400 for initial installation at locations currently impacted by PFAS, as well as an ongoing yearly maintenance cost of $1,284,528. We did not find a public funding mechanism for this type of work alternative and it would likely require special assessments on the village residents.

In order to evaluate Option 2: Public Water System via Local Municipal Source, average and peak demands were estimated based on population for a variety of scenarios including the possibility of future growth as well as the possibility of expanding the system to supply to residences in nearby townships. Then, a conceptual water main layout was created to estimate the cost of a distribution system. Finally, a conceptual design for a treatment facility and storage tank was performed and test wells were drilled to find a potential location. This alternative is estimated to cost $44,000,000 and would involve ongoing operations and maintenance for the treatment facility.

In order to evaluate Option 3: Public Water System via Regional Wholesale Provider, a conceptual estimate for a 17.5 mile long water supply line from Harbor Springs to Pellston was added to the previously computed cost for the distribution system. The cost of the well and treatment facility were omitted. This alternative is estimated to cost $103,300,000 and would involve extensive coordination with nearby municipalities.

Through the performance of the alternative analysis, it was determined that Option 2: Public Water System via Local Municipal Source is the best option for providing safe and reliable drinking water to the Village. The Village has received both Water Infrastructure Improvement for the Nation (WIIN) and Affordability and Planning (AP) grants to study and design the project. Construction is planned to be funded by a Drinking Water State Revolving Fund (DWSRF) grant, which was awarded for fiscal year (FY) 2026.

I. INTRODUCTION

A. BACKGROUND

The Village of Pellston (Village) is located within Emmet County, Michigan. The Village is essentially split by two townships, McKinley Township to the North and Maple River Township to the south, as shown in Figure 1: Village Map. Maple River runs through the southwest corner of the Village, between Pellston Pioneer Park and the Philip J Braun Nature Preserve. The Village is approximately 1.95 square miles in area and had a population of 774 at the time of the 2020 Census. The Village currently does not have any public drinking water or sanitary sewer utilities. Village residents and businesses utilize groundwater through private drinking water wells as their water supply.

In January 2020, Per- and Polyfluoroalkyl Substances (PFAS) was detected by high school students utilizing Freshwater Future PFAS sampling kits in a private drinking water well. PFAS was detected at a level that exceeded the Michigan Environment, Great Lakes, and Energy (EGLE) maximum contaminant levels (MCLs) for perfluorooctane sulfonic acid (PFOS) and perfluorohexane sulfonate (PFHxS). A resampling by EGLE confirmed that that PFAS existed at levels that exceeded the states MCLs, which kicked off the contamination investigation activities.

In February 2020, discussions with Emmet County regarding the use, storage, and handling of Aqueous Film Forming Foam (AFFF) at the Pellston Regional Airport (PLN) began, and additional residential water well sampling and monitoring well sampling were conducted. Through these discussions it was confirmed that the use of AFFF during training activities was performed annually at the airport and EGLE requested that the County complete response activities, as outlined under Section 201114 of Part 201, to assess the PFAS contamination at PLN. As part of a Michigan Department of Transportation PFAS grant, Emmet County completed Phase I and Phase II investigation activities at PLN. Through these investigations EGLE identified the County as the responsible party of contamination and thus the liable party to continue response activities outlined in Part 201.

In April 2022, EGLE approved Emmet County's Response Activity Plan, which details the additional investigation activities and their plan for PFAS impacted soil management. Remediation activities at the airport include application for a Michigan PFAS Action Response Team (MPART) grant to excavate and encapsulate contaminated soils and realign taxiway connections.

As of July 9, 2025, 222 private drinking water wells have been sampled with 158 wells having PFAS detections and 86 wells returning PFAS concentrations exceeding the State's PFAS MCL criteria. The United States Environmental Protection Agency (EPA) established national drinking water standards for PFAS at different concentrations than the EGLE MCLs. Using the EPA MCLs, there are 112 wells that exceed the maximum concentrations. Residential water well testing continues through the Michigan Department of Health and Human Services (DHHS). Point of use (POU) filter systems were offered as a temporary solution for residents that have detectable levels of PFAS chemicals in their private drinking water well.

POU systems are water filtration systems that connect directly to one singular fixture in a home. However, the public has not been satisfied with the low flow rate of 0.7 gallons per minute (GPM) from the filters. There are also concerns that residents are not replacing filters following the MDHHS guidelines and/or disconnecting them due to the low flow rate they provide.

On September 27, 2022, the Village received a Water Infrastructure Improvement for the Nation (WIIN) grant by EGLE through the EPA to complete a drinking water feasibility study to determine the most viable option for providing safe drinking water to the residents of Pellston. The Village also received an Affordability and Planning (AP) grant in the spring of 2024. This grant was awarded to plan and conceptually design a municipal water system, perform a regionalization analysis, perform a preliminary rate study, and develop a Drinking Water State Revolving Fund (DWSRF) project planning document and application. As of fiscal year 2026, the Village is considered overburdened by the Michigan Department of Environment, Great Lakes, and Energy (EGLE) based on the following factors:

1. Their median annual household income is $50,227 which is less than the statewide median annual household income of $66,986.
2. Their taxable value per capita of $21,428 is within the communities representing the lowest 20% of Michigan's population. For FY2025, the Michigan value is $23,778.

There is no existing public water supply in Pellston or any associated assets such as a water treatment plant, distribution system, storage tanks, pump stations, service lines, or water meters. As a result, there are not any existing Village wide systems in place for residuals handling or operations and maintenance and there is no design capacity or climate resiliency features to report.

B. NEED FOR PROJECT

The purpose of this feasibility study is to investigate viable options for providing safe and reliable drinking water to the residents of Pellston. PFAS has been identified in wells at over 100 properties thoughout the Village. These PFAS concentrations are believed to have derived from the AFFF used at the PLN airport for training activities, which has contaminated the unconfined drinking water aquifer in the Village. Many wells contain PFAS at concentrations that exceed both EGLE and EPA drinking water standards. Sampling results indicate many wells exceed the EGLE MCLs for perfluorononanoic acid (PFNA), perfluorooctanoic acid (PFOA), PFOS, and PFHxS specifically. However, the number of homes with PFAS detections and MCL exceedances will likely continue to fluctuate due to potential for plume migration. The current Village treatment methods, POU filters, have not proven to be a long-term solution for the residents. Permanent solutions including the following alternatives were assessed:

1. Point-of-entry (POE) filtration systems
2. Formation of a public water system via Village public source
3. Formation of a public water system via a wholesale provider

II. PFAS INVESTIGATION ACTIVITIES

A. PFAS REGULATORY FRAMEWORK

On April 10, 2024, EPA announced the final National Primary Drinking Water Regulation (NPDWR) for six PFAS compounds including PFOA, PFOS, PFNA, hexafluoropropylene oxide dimer acid (HFPO-DA, commonly known as GenX Chemicals), PFHxS, and perfluorobutane sulfonic acid (PFBS). EPA also established health-based, Maximum Contaminant Level Goals (MCLGs) for these six PFAS. While the MCLGs are non-enforceable, they set public expectations for water treatment goals.

Five of the PFAS compounds, PFOS, PFOA, PFHxS, PFNA, and HFPO-DA, have compound specific EPA MCLs. The EPA MCLs for PFOS and PFOA are each set at 4.0 parts per trillion (ppt) and the other three compounds, PFHxS, PFNA, and HFPO-DA are set at 10.0 ppt, as shown in Table 1. Mixtures containing two or more of the PFAS compounds PFHxS, PFNA, HFPO-DA, and PFBS will be regulated with a combined Hazard Index. A Hazard Index greater than 1.0 would be considered an MCL violation. The Hazard Index is calculated by a sum of the ratios of individual compounds:

$$Hazard\ Index = \frac{PFHxS\ (ppt)}{10\ ppt} + \frac{PFNA\ (ppt)}{10.0\ ppt} + \frac{GenX\ (ppt)}{10.0\ ppt} + \frac{PFBS\ (ppt)}{2000\ ppt}$$

Table 1: EPA PFAS MCLGs and MCLs

Compound	Final MCLG (ppt)	Final MCL (ppt)
PFOA	Zero	4.0
PFOS	Zero	4.0
PFHxS	10.0	10.0
PFNA	10.0	10.0
HFPO-DA (commonly referred to as GenX Chemicals)	10.0	10.0
Mixtures containing two or more of PFHxS, PFNA, HFPO-DA, and PFBS	1.0 (unitless) Hazard Index	1.0 (unitless) Hazard Index

States are required to enforce federal MCLs but also have the authority to establish drinking water MCLs that are more stringent than the Federal levels. EGLE completed the process of promulgating rules to establish MCLs for seven PFAS compounds in 2020. EGLE regulates Perfluorohexanoic acid (PFHxA) in addition to the six regulated by the EPA: PFOA, PFOS, PFNA, PFHxS, PFBS and HFPO-DA. The Michigan PFAS MCLs are shown in Table 2.

Table 2: Michigan PFAS MCLs

Specific PFAS	Drinking Water MCL (ppt)
PFNA	6
PFOA	8
PFHxA	400,000
PFOS	16
PFHxS	51
PFBS	420
HFPO-DA	370

The EGLE MCLs are compound specific and not interrelated as in the EPA Hazard Index. Any exceedance of a single EGLE MCL is considered a violation of that MCL. The Michigan MCLs are currently the only standards in place regulating PFAS compounds in Michigan public drinking water systems. The EPA standards will take time to integrate into existing programs and agencies; however; systems should prepare for these new standards.

B. PFAS SAMPLING ACTIVITIES

As of July 9, 2025, 222 drinking water wells have been sampled by EGLE's contractor with 86 of them returning PFAS at concentrations exceeding the EGLE MCLs for PFAS. Using the EPA MCLs, this corresponds to 112 wells in or adjacent to the Village of Pellston that exceed the maximum concentrations. The sampling results are summarized in Table 3 and Table 4. This report uses the maximum test value from the report updated on July 9.

As of September 2025, DHHS continues to perform resampling activities to determine if POU filters need to be replaced. DHHS has reported that PFAS resampling results appear to be relatively stable. Unless requested, additional wells are not planned to be sampled but it is important to note that contamination may exist outside these properties.

While this project is focused on resolving PFAS contamination in the Village of Pellston, PFAS-affected properties in the area are included in the tabulation as they are affected by the same plume.

Table 3: PFAS Sampling Results by Detection (July 2025)

PFAS Sampling Results	Well Count
PFAS detected	158
PFAS not detected	64
Total Sampled	**222**

Table 4: PFAS Detections by MCL

PFAS Well Sampling Results	PFAS Detected	PFAS MCL Exceedance	PFAS < MCL
EGLE	158	86	72
EPA	158	112	46

As shown in Table 4, a total of 158 properties have detectable PFAS results with 86 of those properties exceeding the EGLE PFAS MCLs and 112 of those properties exceeding the EPA PFAS MCLs. The PFAS sampling results by property are shown in Figure 2: PFAS Sampling Results.

III. DRINKING WATER SERVICE AREA EVALUATION

The proposed initial service area includes land within Village limits, contaminated properties on the border of Pellston, and Pellston Regional Airport. A detailed land use analysis was completed for each parcel within the Village limits to determine if the property was currently occupied, vacant, or had the potential for development to determine existing and future water demands of the service area. The anticipated development type and timeline was estimated based on existing land plotting, the surrounding properties, and conversations with the Village President.

A. TOPOGRAPHY

The elevation across the Village is relatively flat and can be seen in Figure 3: Village Elevations. The area near the Village's southern border along US-31 is the lowest point of elevation at 659 feet above sea level. One of the highest elevation points in the Village is 725 feet above sea level and is located in the northern half of Pioneer Park, south of the baseball fields. There are hills that also reach 725 feet above sea level in the southern portion of the Village along the eastern border. The elevations range from 705-715 feet above sea level in the main vicinity of PLN. However, the elevation reaches 738 feet along the northern border of the airport.

The West Branch of the Maple River flows through the Village in the southwest corner. The river is 16 miles long and is a part of the Cheboygan River Watershed. The West Branch of the River rises in the Pleasant View Swamp, flows north, then east, then south through Pellston, and flows into Lake Kathleen south of the Village and enters to Burt Lake. Near the lowest point of elevation in the Village, US-31 crosses over the river.

Wetlands exist in portions of the Village, primarily along the West Branch of the Maple River and near PLN. Most of the soil in the Village is sand and loamy sand. Loamy sand and wet alluvial land are found near the river in the southwest corner of the Village.

B. DEMOGRAPHIC EVALUATION

The Village had a population of 774 at the time of the 2020 U.S. Census as shown in Table 5. While the population appears to be declining in Pellston, this does not trend with the population of Emmet County, which is projected to grow approximately 4.3% in the next ten years when comparing 2010 U.S. Census Data to 2020 U.S. Census Data. Pellston's proximity to Petoskey and Harbor Springs, as well as being located next to the PLN airport, makes the Village an attractive location for future development. The potential availability of a public drinking water system that provides fire protection could also increase the likelihood of future growth. The population trends for McKinley Township and Maple River Township were assessed in the event that expansion of a public drinking water system outside the Village limits is considered. Maple River Township has had a similar decline in population as the Village, whereas McKinley Township has a slight incline in population. It should be noted that U.S. Census block data were utilized to calculate McKinley Township and Maple River Township populations as the Townships' boundaries fall within the Village's limits and using their reported total population would double count the Village's population.

Table 5: 2020 U.S. Census Population Data

Community	2010 US Census	2020 US Census	% Change
Village of Pellston	822	774	-5.8%
Emmet County	32,694	34,112	4.3%
McKinley Township	674	689	2.2%
Maple River Township	1,170	1,126	-3.8%

The Village's average household size is approximately 2.4 people according to the 2020 U.S. Census. This value was used for demand estimate calculations as discussed in the sections below. According to the 2020 Census, of the 361 housing units within the Village of Pellston, 28 units were vacant. These units may be seasonal housing units that are occupied at specific times. The Village's average household size of 2.4 people was used to estimate an additional 67 persons may be present during certain times of the year in seasonal units. This increases the Village's total population estimate to 841 persons at the time of the 2020 US Census.

Table 6: Village of Pellston Housing Data

Village of Pellston Housing Data	2020 US Census
Housing Units Occupied	333
Housing Units Vacant	28
Average Household Size	2.4

Existing (2023) population estimates were calculated utilizing the Emmet County 4.3% 10-year trend as it provides the most conservative percent change for potential growth. The assumed seasonal housing population of 67 persons within the Village was held constant in the projections. This trend was also utilized for the 5-year

(2028) and 20-year (2043) future population projection estimates. Table 7 below summarizes the existing and future population estimates.

Table 7: Population Projection Estimates

Community	2023 Population Estimate	5 Year Population Estimate	20 Year Population Estimate
Village of Pellston	851	868	919
Emmet County	34,556	35,305	37,554
McKinley Township	698	713	759
Maple River Township	1,141	1,166	1,240

C. LAND USE ANALYSIS

Land use within the Village limits was analyzed to aid in existing and future demand estimation. The Village's 2021 zoning data, as well as aerial and Google Street View imagery, was utilized to assess existing property usage and vacancy status for each parcel. Properties that are zoned residential and appear to be occupied with buildings represent an existing potential user demand in the anticipated service area and were labeled as existing residential properties. Non-Residential zoned properties were analyzed with aerial imagery and Google Street View imagery to assess building usage and vacancy status. These parcels were labeled based on apparent businesses/usage type. Figure 4 is the Village's zoning map from their 2021 Zoning Ordinance. The land use in the Village is summarized in Table 8 below.

Table 8: Land User Type by Percentage

User Type			
Cemetery	2.10%	**Park**	8.60%
Church	0.27%	**Parking Lot**	0.49%
Fire Department	0.08%	**Road**	3.30%
High School Football Field	3.03%	**School**	3.80%
Library	0.11%	**Single- Family Residential**	49.97%
Mixed-Use	0.22%	**Substation**	0.12%
Multi-Family Residential	1.95%	**Trail**	0.10%
Non-Residential	5.75%	**Vacant**	16.30%
Non-Residential/Residential	0.29%	**No information available**	3.52%

Future property usage and development timelines for undeveloped and vacant parcels were evaluated based on existing zoning, land use of neighboring properties, and through conversations with the Village President. Existing vacant and/or undeveloped properties were assigned an approximate development timeline of either 5-years or 20-years. There are some properties that were assumed to be undeveloped in the next 20 years and they

were not assigned a timeline. Figure 5: Anticipated Growth Timeline shows currently known existing/occupied properties and the potential 5-year and 20-year growth locations within the Village limits. Parcels that are identified as existing potential water users were identified as currently developed or related to neighboring developments and unlikely to be further developed.

For large parcels that are not yet plotted, assumptions based on the maximum allowable densities per the Village's Zoning Ordinance and neighboring property layouts were made to estimate the number of potential future parcels and their land use type. Approximately 15% of undeveloped land was reserved for common space such as roads and sidewalks.

A detailed land use analysis to estimate potential additional demands was not completed for the surrounding Townships, McKinley Township and Maple River Township. Instead, demands for the Townships were estimated based on population projections for consideration in the event of system expansion in the future.

D. RESIDENTIAL EQUIVALENT UNIT

The average water use in gallons per capita per day (GPCD) from the United States Geological Survey (USGS), Oakland County Michigan, and the City of Marquette (City), is shown in Table 9. With these sources, it was estimated that on average a person may use approximately 83 gallons per day (GPD). However, a conservative estimate of 100 GPCD was assessed for planning values to follow EGLE's typical per capita planning value for demand estimates.

Table 9: Average Gallons Per Capita

Source	Average (GPCD)
USGS (America)	82
USGS (Michigan)	67
Oakland County Michigan	90
City of Marquette	91
Average	83
Pellston Planning Value	100

A Residential Equivalent Unit (REU) is a unit factor representing the volume of water expected to be used by a single family residential property. A unit factor of 1.0 is assigned to a single-family residential household, while non-residential types are assigned a unit factor relative to single-family residential use. The equations below calculate the volume of water represented by 1 REU. It is estimated that a single-family household within the Village will use on average about 240 GPD. This anticipated usage value includes apparent and non-apparent water losses, such as hydrant flushing or system leaks.

$$1\ REU = Single\ Family\ Residential\ Water\ Use$$

$$1\ REU = Average\ Household\ Size\ \times\ Average\ GPCD$$

$$1\ REU = 2.4\ people\ \times\ 100\ GPCD$$

$$1\ REU = 240\ GPD$$

Many communities develop and utilize tables that summarize REU factors based on property usage type. These factors assist communities in estimating the amount of water a new development is anticipated to draw from their systems. An estimated REU factor was assigned based on apparent and anticipated land use to each parcel utilizing available REU factors from the sources included in the service area evaluation. Figure 6: REU Estimates shows the estimated REUs for each parcel within the Village limits. The REUs were divided based on the existing, 5-year, and 20-year land use analysis. It was assumed that the parcels that have 0 REUs will not be developed or will not be utilizing public water within the next 20 years. A summary of the Village's estimated existing, 5-year, and 20-year REU values is shown in Table 10 below.

Table 10: Village of Pellston REU Estimates

Village REU Estimate	Existing	5-Year	20-Year
Total REUs	457	650	917
Additional REUs	--	193	267

DOMESTIC DEMAND ESTIMATES

As the Village currently uses private wells for their water needs, their water demands need to be estimated to support this feasibility study. Water demand estimates are necessary to size a potential water system or to assess the capacity impact of adding on users to an existing water system. The three demand scenarios that were analyzed are described below:

- **Average Daily Demand** – The amount of water expected to be demanded daily on average throughout the year.
- **Maximum Daily Demand** – The amount of water expected to be demanded on the highest use day of the year. This day commonly occurs during the summer months.
- **Peak Hour Demand** – The amount of water expected to be demanded during the highest use hour of the year. This hour usually occurs in the morning or early evening during the summer months.

The Village's demand was calculated by converting the total REUs within the Village limits to a demand rate. The REU value of 240 GPD, which is equal to 0.17 GPM, was multiplied by the total existing, 5-year, and 20-year REU values to estimate the Village's average daily demands as summarized in Table 11 below.

Table 11: Village of Pellston Average Daily Demand Estimate

Village of Pellston	Existing Demand	5-Year Demand	20-Year Demand
Total REUs	457	650	917
Average Daily Demand (GPM)	76	108	153

Emmet County was contacted to provide airport demand estimates as it was assumed the airport would connect to a potential new water system. Emmet County estimated that the airport's water usage is approximately 4 GPM. It was assumed that airport traffic would increase relative to growth within the County and as airport traffic increased so would the airport's water usage. The Emmet County growth projection was utilized to estimate the airports 5-year and 20-year demand estimates as shown in Table 12.

Table 12: Pellston Regional Airport Average Daily Demand Estimate

Pellston Regional Airport	Existing Demand	5-Year Demand	20-Year Demand
Average Daily Demand (GPM)	4	4	5

The water demand from McKinley Township and Maple River Township was also estimated based on their population projections and the per capita demand of 100 GPD. This conservative estimate assumes potential future interest in public drinking water within the Townships, despite their sparse populations. Initially, connections are expected primarily from bordering properties in the early stage of developing a Village water system. The demands of the Townships are summarized in Table 13.

Table 13: Townships Average Daily Demand Estimate

Township Demand	Existing Demand	5-Year Demand	20-Year Demand
Maple River Township Average Daily Demand (GPM)	79	81	86
McKinley Township Average Daily Demand (GPM)	49	50	53

To calculate the maximum daily demand, a peaking factor of two was applied to the average daily demand. To estimate the peak hour demand, a peaking factor of four was applied to the average daily demand. These factors represent typical industry standards. It should be noted that the peak hour factor of four was not applied to the airport as this is a unique industry that would be unlikely to experience a large increase in demand during normal operations. Peaking factors are provided in Table 14 below.

Table 14: Peaking Factors

Demand Scenario	Peaking Factor
Average Daily Demand	1.0
Maximum Daily Demand	2.0
Peak Hour Demand	4.0

The existing, 5-year, and 20-year demand scenarios for the Village, Mckinley Township, and Maple River Township were estimated based on the peaking factors above. A summary of the demands is shown in Table 15 below.

Table 15: Demand Scenario Summary

Scenario	Customer	REU Estimate	Average Day Demand (GPM)	Max Day Demand (GPM)	Peak Hour Demand (GPM)
Existing	Village of Pellston	457	76	152	304
	PLN Airport	25	4	8	9
	McKinley	291	48	96	194
	Maple River	475	79	158	316
	Village + PLN Airport Total	482	80	161	313
	Total of All	1,248	208	416	824
5 YR	Pellston	650	108	217	433
	PLN Airport	26	4	9	9
	McKinley	297	50	99	198
	Maple River	486	81	162	324
	Village + PLN Airport Total	675	113	225	442
	Total of All	1,458	243	486	964
20 YR	Pellston	917	153	306	611
	PLN Airport	27	5	9	9
	McKinley	316	53	105	211
	Maple River	517	86	172	344
	Village + PLN Airport Total	944	157	315	620
	Total of All	1,777	296	592	1,176

Low Demand Scenario

While the potential Average Day, Max Day and Peak Hour flows help to size the system based on the flows that may be necessary in the system for alternatives with distribution system, it is also important to check system performance for low demand scenarios. Not every residence in the Village of Pellston will connect to the system, especially initially.

In addition, O&M costs associated with the Wholesale Regional and Local Municipal Source will vary somewhat based on the number of users.

Since the terms of the grant specify that greater than 50% of properties with current active wells must connect to the proposed new system in order for the funding to be secured, it was determined that a reasonable low demand scenario would be based on a 51% connection rate.

In order to determine this flow rate, parcels within range of the distribution network were classed into residential, commercial and large users (the airport and the school). Since the airport and school have expressed interest in connecting, it was assumed that they would connect. Besides these, 50% of residential properties and 50% of commercial properties were assumed to connect. REUs and corresponding flow rates for the large users and 50% of commercial and 50% of residential properties were then calculated as 48.5 GPM.

As of December 17, 2025, residents at 193 properties with active wells in the Village had communicated their desire to connect to the new system out of 353 properties in the village estimated to have active water wells.

Figure 7 shows results of the survey.

IV. SINGLE HOME POE FILTRATION ALTERNATIVE

A. ALTERNATIVE OVERVIEW

Pellston residents have been given POU filters for a temporary solution; however, there are concerns about residents not replacing the filters or disconnecting them due to the low flow rate they provide. As a result, POE systems were evaluated as an alternative solution for Village residents. POE systems are whole home filtration systems that treat the water that enters a residence, with the ability to treat large amounts of water each day. For example, a POE system can produce 8 GPM of treated water compared to the 0.7 GPM presently being provided by the POU systems in place. The water used throughout the house is filtered, which reduces the risk of inhaling PFAS compounds volatilized during showering, provides clean water for garden irrigation, and can help preserve appliances as well as plumbing. Another advantage of POE systems is that they remove PFAS compounds from water, so these compounds do not enter the septic field. The septic fields in Pellston are primarily sand soil systems and PFAS can continue to circulate in the soil of the region, creating further contamination. In order to treat PFAS concentrations consistently, it is required that maintenance and sampling are performed by a licensed operator and completed regularly. As a result, POE systems require frequent coordination with residents to give operators access to not only install the system but maintain it regularly.

These systems could be used as an interim measure to treat the water in Pellston until a long-term solution is identified. A full analysis of the application of POE systems in Pellston to address PFAS contamination was performed and can be found in Appendix B. PFAS has been detected in 158 properties in or near Pellston in varying concentrations. Currently, 86 of those properties contain concentrations of PFAS that exceed the EGLE Maximum Contaminant Levels. Using the EPA MCLs, there are currently 112 properties that exceed the maximum concentrations. A map of the wells that would require filtration to meet the EGLE MCLs and EPA MCLs is shown in Figure 2. These wells contain amounts of PFAS ranging from just over the regulations to

substantially greater than the MCLs. The absolute number of households in or around Pellston that would need filtration units is in flux because plume delineation is ongoing and the PFAS regulatory framework is evolving.

B. IMPLEMENTATION

1. INSTALLATION

Installation of a POE system would require an initial site visit by plumbing and electrical licensed professionals to determine if the property has an appropriate area to house the POE system. It is estimated that one to two systems could be installed per day after the initial site visits are completed and locations have been selected for the systems. The systems have specific site requirements, which include a heated indoor space with an adequate area size and level of accessibility. Other factors considered when identifying an area for the system include the layout of mechanical systems and electrical outlets. If there is not an existing area available to house the system, a new structure would have to be constructed to house the POE system. The Aquasana OptimH2O POE system and the Culligan Portable Exchange Carbon Filter System were referenced to determine site requirements. If this alternative is decided to be explored further, it is assumed a more detailed review of POE options will be completed and the most appropriate unit will be used for detailed design. The Aquasana OptimH2O is approximately 43" in width, 42" in height, and 8" in depth. The Culligan system is approximately 51" in width, 60" in height, and 12" in depth. However, the use of additional filtration units would increase the area required for installation. The system requires a nearby ground fault interrupter (GFI) outlet, and this should be installed if the selected location does not already contain one. The diameter of the existing water pipes should be measured ahead of time to mitigate complications throughout the installation process. The selected location for system installation should be reviewed and discussed with the homeowner. The equipment required for POE system installation includes:

- Two or more granular activated carbon (GAC) filters installed in series.
- Sampling ports
- Ball valves
- Flow restrictor
- Flow meter
- Pressure gauges

Additional equipment may include pipe thread tape, pipe joint adhesive/solvents, piping, and valve parts. Shut off valves and by-pass piping would be installed to allow the system to be isolated and drained during repairs or maintenance. The sampling ports would be installed at the beginning of the system to sample the untreated well water, in between filters to monitor individual filter status, and after the filters to observe effluent concentrations. The locations of the sampling ports should take accessibility into account since they would be used regularly. Throughout the system, all materials should be PFAS-free and Teflon-free, which may require coordination with manufacturers. Bacterial disinfection is provided by an ultraviolet (UV) disinfection unit downstream of the GAC cartridges.

In the evaluation of this alternative, it was assumed that POE systems would be installed in locations where PFAS has been detected and that the systems would have a PFAS reduction rate of 97.9%. This alternative was evaluated when aiming to achieve acceptable concentrations according to both EGLE and EPA MCLs. Currently, a total of 158 properties would require a POE system, with the understanding that the number of homes requiring filtration will fluctuate due to plume migration and any future changes to MCL requirements. Most systems installed would only require two filters (the minimum requirement of a lead filter and lag filter) to achieve acceptable concentrations. However, for locations with high enough concentrations, two filters is not enough to reduce levels below the MCL and a third filter would need to be added. If the EPA MCLs were used, 15 locations would need a system with three filters; if EGLE MCLs are used, only one location would need a system with three filters. As a result, they would need an additional intermediary filter for compliance, causing increased installation and operations and maintenance costs.

2. OPERATIONS AND MAINTENANCE

There is a substantial number of operations and maintenance requirements for this alternative. Samples should be collected after both the lead and lag filters. The compliance point is the sample taken after the lead filter, as the lag filter serves as a secondary insurance measure. If breakthrough were to occur in the lead filter, the lag filter would continue to treat the water until the lead filter can be changed out. Sampling after the lag filter allows the concentrations at the entry point to the distribution system to be measured. The frequency of filter replacement would be dependent on the PFAS concentrations the filters are treating and replacement should be prompted by sampling results or the manufacturer's recommendations. When a filter is replaced, samples should be taken prior to the replacement and after. All work performed on the system, including sampling, is required to be performed by a licensed operator. In-home surveys should be completed along with sample collection to gather information on the filter's status and other information required for public health investigations.

Different approaches can be taken to sampling and filter change out frequencies, however a concentration-based approach is the most cost-effective. Each location would be grouped based on existing concentrations and operations and maintenance schedules would be specific to that group. This would ensure that each location is being thoroughly monitored without expending resources at locations with lower concentrations. The specific maintenance approaches explored are described more in depth in the cost section below. Disposal processes and costs for spent filters from the systems are unknown and it is not clear who would be handling this part of the system's operation. This would require an ongoing discussion and an eventual agreement between the involved parties.

C. COSTS

Costs were estimated for the single home filtration alternative to install and maintain systems for locations that have detected PFAS concentrations. The absolute number of households in or near Pellston that would need filtration units is in flux because plume delineation is ongoing and the PFAS regulatory framework is evolving. As mentioned, the EGLE and EPA MCLs have different requirements and costs were developed when referencing both agencies' MCLs. The estimated costs were based on two sources, the costs provided from a similar project in Camp Grayling, Michigan and costs provided by McCardel Culligan Water of Traverse City

(Culligan). The costs from the Camp Grayling example were scaled to the situation in the Village of Pellston. The costs provided by Culligan were estimated based on existing PFAS concentrations in Pellston and could change depending on fluctuating PFAS concentrations, water quality, and the number of homes requiring filtration systems. Two different monitoring approaches were evaluated, which are described in more detail in the text below, and these approaches also referenced Camp Grayling and Culligan costs. The anticipated annual costs for the installation and maintenance of POE systems in Pellston are preliminary. The different alternatives that were explored for cost estimating purposes are described in Table 16.

Table 16: Cost Estimate Alternatives

Cost Estimate Alternatives			
Target Regulations	Installation - Costs	Monitoring – Approach	Monitoring - Costs
EGLE MCLs	Camp Grayling, MI Costs	Quarterly Monitoring Approach (Camp Grayling, MI)	Camp Grayling, MI Costs
			Culligan Costs
	Culligan Costs	Concentration-Based Monitoring Approach (Plainfield/Algoma Townships, MI)	Camp Grayling, MI Costs
			Culligan Costs
EPA MCLs	Camp Grayling, MI Costs	Quarterly Monitoring Approach (Camp Grayling, MI)	Camp Grayling, MI Costs
			Culligan Costs
	Culligan Costs	Concentration-Based Monitoring Approach (Plainfield/Algoma Townships, MI)	Camp Grayling, MI Costs
			Culligan Costs

1. INSTALLATION

Installation costs were estimated using the two different sources mentioned, Camp Grayling and Culligan. Additional costs could be required to build a structure to house the system if an area is not currently available. Installation in Camp Grayling was estimated to cost up to $10,000-$15,000 per unit due to the construction of external heated enclosures. The middle of this range was used as a conservative estimate for installation costs from Camp Grayling. This represents the higher end of installation costs if more structures needed to be built for comparison purposes. The other Camp Grayling costs were referenced from a quote for the project and represent the cost of the filtration unit, plumber and electrician fees, and management and oversight fees for installation. The installation costs per unit as well as the total installation costs for Pellston when using EGLE MCLs can be found in Table 17. The costs provided for the project in Camp Grayling included an additional lump sum cost of $3,790 for a health and safety plan for the project; this was not included in the installation costs. The exact type of POE system used could impact installation and

operations and maintenance costs. The system including the specific equipment and parts used would be reviewed and identified if POE systems were selected for implementation and the project developed further.

Testing indicates that one well would require three filters to meet EGLE MCL requirements.

Table 17: Installation Costs (EGLE MCLs)

Installation Costs					
Source	Item	Cost per Location	Locations	Cost	Total Cost
Camp Grayling, MI (Conservative*)	Installation (2 filters)	$12,500	157	$1,962,500	$1,976,908
	Installation (3 filters)	$14,408	1	$14,408	
Camp Grayling, MI	Installation (2 filters)	$4,786	157	$751,402	$758,096
	Installation (3 filters)	$6,694	1	$6,694	
Culligan	Installation (2 filters)	$8,300	157	$1,303,100	$1,313,400
	Installation (3 filters)	$10,300	1	$10,300	

Note: *Conservative estimate is based on costs associated with locations that required the construction of external heated enclosures.

When using the EPA MCLs as the threshold, 15 POE systems would require three filter units, while the remaining 143 systems would require two filter units. The 15 systems with three filter units would require two lead filters to treat the water to an acceptable concentration followed by a lag filter. This is based on the reduction rate given for the system in Grayling and the same rate was assumed for the Culligan system for comparison purposes. The specific reduction rate for the Culligan system is dependent on water quality and could be further investigated with a field study in Pellston. The number of homes in Pellston that would require a POE system and more specifically a system with three filter units may fluctuate due to plume migration and the reduction rate of the Culligan system if selected for implementation.

Table 18 shows the installation costs per unit and total installation costs when using EPA MCLs.

Table 18: Installation Costs (EPA MCLs)

Installation Costs					
Source	Item	Cost per Location	Locations	Cost	Total Cost
Camp Grayling, MI (Conservative*)	Installation (2 filters)	$12,500	143	$1,787,500	$2,003,620
	Installation (3 filters)	$14,408	15	$216,120	
Camp Grayling, MI	Installation (2 filters)	$4,786	143	$684,398	$784,808
	Installation (3 filters)	$6,694	15	$100,410	
Culligan	Installation (2 filters)	$8,300	143	$1,186,900	$1,341,400
	Installation (3 filters)	$10,300	15	$154,500	

Note: *Conservative estimate is based on costs associated with locations that required the construction of external heated enclosures

2. OPERATIONS AND MAINTENANCE

The operations and maintenance costs were estimated using both the Camp Grayling and Culligan costs. Two different monitoring approaches were explored, a quarterly monitoring approach and concentration-based monitoring approach.

The quarterly monitoring approach was described for the project in Camp Grayling. This method requires quarterly sampling and assumes 75% of the systems installed would need a filter replacement per year. However, filter replacement costs may vary depending on water quality and could be adjusted as the systems are monitored. Costs were estimated using the quarterly monitoring approach for the Camp Grayling and Culligan supplied costs and are shown in Table 19 and Table 20, respectively. It should be noted that some maintenance items were assumed for a percentage of systems and the costs were evenly distributed to provide an average cost per location. However, some operations and maintenance items were included in the Camp Grayling costs that were not addressed in the Culligan costs (homeowner requested maintenance, issues, etc.). The Culligan cost estimate could increase with the addition of these items and the specific list of items included can be seen in the tables below.

Table 19: Quarterly Monitoring Approach using Camp Grayling, MI Costs (EGLE MCLs)

Quarterly Monitoring Approach (Camp Grayling, MI Costs)					
Item	Unit Cost	Yearly Occurrences	Cost per Location per Year	Total Locations	Total Cost per Year
Sampling	$776	4	$3,102	158	$490,116
Home Owner or MDMVA requested O&M or Issue	$1,684	Assumed 1 for 30% of locations	$505	158	$79,790
Home Owner Scheduled Appointment – Owner No Show	$200		$60	158	$9,480
Pre & Post Filter Replacement Home Water Sampling	$3,151	Assumed 1 for 75% of locations	$2,363	158	$373,354
Home Water Filter Replacement	$1,259		$944	157	$148,208
	$2,518		$1,888	1	$1,888
Total per Location (2 filters)			$6,975	Total All Locations	$1,102,836
Total per Location (3 filters)			$7,919		

Table 20: Quarterly Monitoring Approach using Culligan Costs (EGLE MCLs)

Quarterly Monitoring Approach (Culligan Costs)					
Item	Unit Cost	Yearly Occurrences	Cost per Location per Year	Total Locations	Total Cost per Year
Sampling	$1,215	4	$4,860	158	$767,880
Pre & Post Filter Replacement Home Water Sampling	$2,355	Assumed 1 for 75% of locations	$1,766	158	$279,028
Home Water Filter Replacement	$1,853		$1,390	158	$218,230
	$3,453		$2,590	1	$2,590
Total per Location (2 filters)			$8,016	Total All Locations	$1,267,728

The second monitoring approach uses a concentration-based approach. The performance monitoring sampling schedule for this project groups the existing concentrations into categories and assigns a sampling schedule to each category. This approach also assigns filter change out frequencies and the percentage of systems sampled after change outs based on influent concentrations. This approach reduces costs as more resources are allocated towards locations with higher concentrations than the lower concentration locations. The schedules used for the systems in Pellston may need to be adjusted as the systems are monitored. This

approach groups the locations based on the sum of PFOA and PFOS concentrations. In Pellston, other regulated PFAS compounds are present. These other compounds were taken into consideration and some locations were moved to a more frequent schedule based on existing concentrations in relation to the specific compound's MCL. Of the 158 locations in Pellston that would require a POE system, 115 of those locations would fall into the first category where sampling would be performed semi-annually. The remaining 43 locations would fall into the second category where sampling would be performed quarterly, with one of those locations requiring three filters. The costs were estimated using the concentration-based monitoring approach as well as the Camp Grayling and Culligan costs and can be found in Table 21. The estimated yearly costs are significantly less than the quarterly monitoring approach.

Table 21: Concentration-Based Monitoring Approach using Both Costs (EGLE MCLs)

Concentration-Based Monitoring Approach							
Concentration (PFOS + PFOA)	Locations	Sampling Events per Year	Cost Source	Total Sample Cost per Location per Year	Total Change Out Cost per Location per Year	Total Cost per Location per Year	Total Pellston Cost per Year
1 – 70 ppt	115	2	Camp Grayling, MI Costs	$1,695	$1,062	$2,757	$317,055
			Culligan Costs	$2,641	$1,478	$4,120	$473,800
71-1000 ppt	42	4	Camp Grayling, MI Costs	$3,384	$1,181	$4,565	$191,730
			Culligan Costs	$5,274	$1,567	$6,841	$287,322
	1		Camp Grayling, MI Costs	$3,384	$2,125	$5,509	$5,509
			Culligan Costs	$5,274	$2,767	$8,041	$8,041
Total (Camp Grayling, MI Costs)							$514,294
Total (Culligan Costs)							$769,163

Estimated costs for the use of the quarterly monitoring approach to achieve compliance with the EPA MCLs are shown in Table 22 using Camp Grayling costs and Table 23 using Culligan costs.

Table 22: Quarterly Monitoring Approach using Camp Grayling, MI Costs (EPA MCLs)

Quarterly Monitoring Approach (Camp Grayling, MI Costs)					
Item	Unit Cost	Yearly Occurrences	Cost per Location per Year	Total Locations	Total Cost per Year
Sampling	$776	4	$3,102	158	$490,116
Home Owner or MDMVA requested O&M or Issue	$1,684	Assumed 1 for 30% of locations	$505	158	$79,790
Home Owner Scheduled Appointment – Owner No Show	$200		$60	158	$9,480
Pre & Post Filter Replacement Home Water Sampling	$3,151	Assumed 1 for 75% of locations	$2,363	158	$373,354
Home Water Filter Replacement	$1,259		$944	143	$134,992
	$2,518		$1,888	15	$28,320
Total per Location (2 filters)			$6,975	Total All Locations	$1,116,052
Total per Location (3 filters)			$7,919		

Table 23: Quarterly-Based Monitoring Approach using Culligan Costs (EPA MCLs)

Quarterly Monitoring Approach (Culligan Costs)					
Item	Unit Cost	Yearly Occurrences	Cost per Location per Year	Total Locations	Total Cost per Year
Sampling	$1,215	4	$4,860	158	$767,880
Pre & Post Filter Replacement Home Water Sampling	$2,355	Assumed 1 for 75% of locations	$1,766	158	$279,028
Home Water Filter Replacement	$1,853		$1,390	143	$198,770
	$3,453		$2,590	15	$38,850
Total per Location (2 filters)			$8,016	Total All Locations	$1,284,528
Total per Location (3 filters)			$9,216		

The second monitoring approach, the concentration-based approach, was also investigated to achieve acceptable concentrations according to the EPA MCLs. In the higher concentration category, the systems that would require three filters (15 locations) are separated due to an increase in costs for filter change outs. The costs were estimated using this monitoring approach in Table 24.

Table 24: Concentration-Based Monitoring Approach using Both Costs (EPA MCLs)

Concentration-Based Monitoring Approach							
Concentration (PFOS + PFOA)	Locations	Sampling Events per Year	Cost Source	Total Sample Cost per Location per Yeat	Total Change Out Cost per Location per Year	Total Cost per Location per Year	Total Pellston Cost per Year
1 – 70 ppt	115	2	Camp Grayling, MI Costs	$1,695	$1,062	$2,757	$317,055
			Culligan Costs	$2,641	$1,478	$4,120	$473,800
71-1000 ppt	28	4	Camp Grayling, MI Costs	$3,384	$1,181	$4,565	$127,820
			Culligan Costs	$5,274	$1,567	$6,841	$191,548
	15		Camp Grayling, MI Costs	$3,384	$2,125	$5,509	$82,635
			Culligan Costs	$5,274	$2,767	$8,041	$120,615
						Total (Camp Grayling, MI Costs)	$527,510
						Total (Culligan Costs)	$785,963

3. SINGLE HOUSEHOLD COSTS

The total cost of the installation of POE systems in each home in or near Pellston that has detectable PFAS concentrations can be broken down into individual costs per household. There are capital costs for the initial installation of the systems in each home and the ongoing operations and maintenance costs that would be required for each year the system operates. The total year one costs include installation and the first year of operations and maintenance costs and the ongoing yearly costs include only operations and maintenance costs. The estimated costs are dependent on the costs referenced and could vary depending on the monitoring approach selected for implementation. These costs are described in the tables above for each investigated approach but are listed as single household costs in Table 25 based on EGLE MCLs. Operations and maintenance costs were estimated using the average between the two cost sources for the approach listed. Single household total year one costs were estimated to be between $8,222 and $19,661, depending on the approach and reference material used.

Table 25: Single Household Installation and Ongoing Yearly Costs

Single Household Costs			
Installation	Monitoring Approach	Average Total Year 1 Cost	Average Ongoing Yearly Costs
Camp Grayling, MI Costs (Conservative)	Quarterly Monitoring Approach	$19,661	$6,980
	Concentration-Based Monitoring Approach	$15,936	$3,255
Camp Grayling, MI Costs	Quarterly Monitoring Approach	$11,947	$6,980
	Concentration-Based Monitoring Approach	$8,222	$3,255
Culligan Costs	Quarterly Monitoring Approach	$16,513	$8,024
	Concentration-Based Monitoring Approach	$13,358	$4,868

When using the EGLE MCLs as the target, the project would cost less than using the EPA MCLs. For future cost comparisons between alternatives, the EPA MCLs will be used as the target concentrations for compliance and the quarterly monitoring approach will be assumed for the systems. This combination would be the most conservative approach to installation as well as operations and maintenance. For cost referencing, the pricing provided by Culligan will be referenced. These costs are recent quotes from a location near Pellston that could potentially perform the work, rather than a reference from another project location. The number of homes with PFAS concentrations is subject to change and costs could be reduced if systems were only installed at locations with exceedances.

D. EFFECTIVENESS

The POE system referenced has a PFAS reduction rate of 97.9% and can treat 100,000 gallons at a flow rate of 8 GPM before requiring a filter change. However, similar systems have treated 140,000 to 160,000 gallons before requiring a filter change out. These systems have operated for a minimum of one year without breakthrough at concentrations higher than the concentrations found in Pellston currently. In order to be effective, these systems have to be properly maintained on a regular basis. As a result, EGLE does not prefer POE systems as a long-term alternative for drinking water systems because long-term use is complicated. Additionally, EGLE has observed failures with the filters in Grayling. However, they would be accepted by EGLE as an interim measure if the systems were maintained by a qualified professional. POE systems could primarily serve as a temporary solution for Pellston since each system would require ongoing maintenance and frequent homeowner coordination. They could be used to improve the affected residents' level of service until a long-term solution is implemented for the Village.

SUMMARY

The advantages of the single home filtration alternative include presenting less risk in comparison to POU systems. POE systems can treat large amounts of water each day and the water used throughout the house is filtered. These systems must be maintained and sampled regularly by a licensed operator, which eliminates the possibility of a homeowner removing the system or using it improperly. However, regular maintenance and sampling would require an operator to enter households frequently and involve coordination with homeowners. This would also result in considerable operational costs. Additionally, the list of homes that require POE systems in Pellston changes frequently due to fluctuating concentrations. The estimated costs do not include installation and operational costs for additional systems that may be needed in the future. When using the EPA MCLs as the target, quarterly monitoring approach, and Culligan pricing, installation was estimated to cost $1,341,400 to install systems at 158 properties where PFAS has been detected. Operations and maintenance is estimated to cost $1,284,528 per year for the systems.

Since POE systems require ongoing maintenance and sampling, a public water system would require less coordination with homeowners in the long-term and pose less risk of PFAS exposure. However, this alternative could be completed much sooner than a public water system so it could serve as a temporary solution until a long-term solution is implemented. A full investigation of single home filtration as an alternative for the Village can be found in Appendix B.

V. PUBLIC WATER SYSTEM VIA LOCAL MUNICIPAL SOURCE

A. ALTERNATIVE OVERVIEW

The list of homes that would require POE systems in Pellston will vary due to fluctuating concentrations. Since POE systems would require ongoing maintenance and sampling to ensure the water was safe, a public water supply would require less coordination with homeowners in the long-term and pose less risk of PFAS exposure.

The installation of a public water distribution system with a public well, water treatment plant, and water storage was explored as an alternative for the Village of Pellston. This alternative would give residents reliable drinking water that is regularly monitored for compliance with EGLE standards. The Village residents currently utilize groundwater through private wells as their water supply. From an on-going operation and maintenance perspective, a public groundwater supply source is likely the most feasible option.

The water main layout to be installed is shown in Figure 8. The selected material for water main installation is ductile iron. The water main layout will include valves, fire hydrants, and service lines for developed land. Applicable EGLE procedures, Ten States Standards, as well as local ordinances, shall be strictly adhered to during design and construction.

B. LOCAL SOURCE GROUNDWATER EVALUATION

To explore potential Type I water well locations, a preliminary groundwater resource evaluation was performed by Williams and Works. This information was formatted into a Tech Memo which can be found in Appendix C. Wellogic water well records, interviews with local water well drillers, and the reports generated by EGLE

and the County were used to perform the evaluation. A highly conservative factor of safety was maintained to avoid creating a new Type I wellfield that eventually becomes contaminated. There are many existing private wells installed in the shallow groundwater system and most are less than 100 feet in depth. Since deep well records are rare in this area and the mapping of the aquifer is based on the limits of data, the complete mapping of the shallow aquifer is imperfect. Based on the evaluation, areas were identified for additional groundwater exploration. These areas are a conservative distance from the groundwater contamination limits. The primary well locations investigated for implementation include the area along Ely Road between Ely Bridge Road and Mackinaw Highway, the area along Robinson Road between Durkalic Road and Red School Road, and the area along Robinson Road between Townline Road and State Street. In April 2025 three wells were drilled, one in each of the three exploratory areas. The exploratory well sites were compared with each other on the basis of water quality and available flow and the best option selected. The well site selected is a property owned by Pellston Schools and is on the south side of Robinson Road about half a mile east of Townline Road. The results of the exploratory well drilling are found in Appendix D.

C. WATER TREATMENT PLANT EVALUATION

Exploratory well quality results at the chosen wellfield site indicate that the water quality is sufficient for use as a municipal water source without extra treatment. Aesthetic parameter of iron and manganese were found to be at 'nuisance' levels and could be treated if desired. Total hardness is 178 mg/L as calcium carbonate ($CaCO_3$), which is considered on the edge between "hard" and "very hard".

Two treatment options are recommended: Chlorination and iron removal.

Chlorination, while not technically required initially, may be required at some point depending on bacteria testing. It is recommended to install a chlorination feed when the system is built. Without iron removal filters at the wellfield site, it is likely that chlorination will cause the iron in the water to oxidize, bypass any in-house iron removal, and fall out as rust at the point of use. Although this is not a health concern, it has the potential to damage public trust of the municipal water supply. For this reason, iron removal is recommended for this system. It would be possible to install a system-wide softener at the treatment plant; this is not currently one of the recommendations but could be considered during final design if desired.

The recommended wellsite and treatment plant layout would have an approximate footprint of 5.15 acres proposed for the northeast corner of the school site. To include room for well setbacks and some buffer, the total wellsite footprint is approximately 500 ft wide along Robinson Rd and 550 ft long. The first of two 8" Class 1 production wells would be located 200 ft from both the north and east property lines. The second well would be located 100 ft due south of the first. The wells would be connected via 8" ductile iron pipe to an 1,800 square foot treatment building approximately North-Northeast of the first well and set back from the road by 40 ft. An access road connects the two wells and the treatment building to Robinson Rd. A generator to power treatment processes and wells would be adjacent to the building. To the west of the treatment plant and outside of the 200 ft well setback would be a 5,000 square foot infiltration bed for the backwash from the iron filters. From the building, the water is piped north to Robinson Rd and west along Robinson Rd approximately half a mile to where it meets the distribution system at the intersection of Robinson Rd and Townline Rd. A conceptual well site layout is included in Figure 9.

D. STORAGE TANK EVALUATION

Standards recommend different ways to size community storage. These include one average day's volume, fire protection, or supplementing demands greater than the source/treatment capacity. Community storage for the Village's system was designed based on estimated average day demand and fire protection, as both exceed the volume needed to supplement peak demands. As a result, a 150,000-gallon tank is recommended for the system design. A low water level of approximately 100,000 gallons was estimated, assuming the tank fluctuates 1/3 of its volume daily. A fire protection rate of approximately 833 GPM for a 2-hour fire would be provided and this could be supplemented from the excess source capacity. The water treatment plant should operate based on tank level to encourage cycling of the water tank. An elevated storage tank is recommended, and preliminary discussion has focused on Pellston Pioneer Park as a storage tank location for the Village. If this location was selected, a preliminary hazard assessment would be required due to the proximity to the PLN airport. Initial conversations with MDOT have noted the maximum elevation at this site without needing an extended study is 871 feet above mean sea level. The storage tank total elevation is estimated to be 865 feet.

DISTRIBUTION SYSTEM PIPING EVALUATION

The conceptual water main layout extends to the developable land within Village limits where applicable, totaling approximately 12.5 miles. There are several areas in the Village where future development is not expected, as a result, water main does not extend to these areas. However, water main could be installed in these locations in the future for tie-in to the existing system. The layout extends outside of Village limits to the PLN airport for tie-in to the system. The water main design includes 6 and 8-inch ductile iron water main with valves and hydrants placed in compliance with Ten States Standards. The layout includes 8-inch water main for the key corridors throughout the Village (Mill Street, US-31, and Milton Street) and 6-inch for the remaining areas. The water main would primarily be installed using open cut installation, with directional drilling used in areas where water main crosses US-31 and along Lahti Lane. Service lines are included for developed land. The layout does not include service lines for future growth areas including planned residential development. The service line sizes used in the layout include 1-, 2-, and 3-inch services and costs were included for both the public and private side of each service line. Costs were also included for curb stop boxes and water meters within the service line pay items. Service lines were added from the water main outside of Village limits to PLN airport as well as the developed properties across from the airport. Pellston zoning, assigned REU values, and the existing system at PLN airport were referenced to determine service line sizes. The conceptual layout includes 401 service lines in total. The conceptual water main layout can be seen in Figure 8.

The water main layout referenced is a conceptual design, primarily intended for cost estimating. A more detailed design of the layout would need to be completed prior to construction. There are numerous factors to take into consideration for this project's construction, especially since work would occur throughout the entire Village. The water main installation would impact sidewalk, driveways, pavement, and aggregate base. The costs of removing and replacing these items were estimated and included in the cost estimate but they would need to be reassessed during the design phase. Costs were estimated and included for budgeting purposes for mobilization, design, construction engineering, administration, geotechnical services, traffic maintenance and

control, soil erosion and sedimentation control, restoration and tree removal. Several items would have to be investigated prior to construction, these include property acquisition and easements, utility conflicts, wetland delineation, and the existing road surface and driveway types in areas impacted by water main installation. There are costs associated with each of these items that would need to be considered. As mentioned, tree clearing costs were estimated and included however, these costs may need to be adjusted during design. The layout is estimated to cost $22,300,000 including water main, associated appurtenances, and restoration.

1. FIRE PROTECTION

While there is no legal obligation for a governing body to size its water distribution system to provide fire protection, the Village has expressed interest in the ability to do so. The ability to be able to provide fire protection results in protection of the tax base from destruction by fire, preservation of human life and jobs, and financial savings can be realized through insurance rates. In addition, the ability to provide fire protection increases development appeal.

Systems that provide fire protection must be sized to provide maximum daily demands during the event of a fire without dropping the pressure below 20 psi. Sizing a system to provide fire protection can result in poor water quality if the system's normal domestic demands can't cycle the water through the system fast enough. A balance must be reached to ensure a system is not oversized to meet conservative fire protection goals. The governing body must select a well-documented procedure for determining the fire flow requirements of the system. Most follow the methods developed by the Insurance Services Office (ISO) and responsibility for determining needed fire flows for individual structures usually rests with the local fire officials (AWWA M31).

It was determined through conversations with Emmet County that their desired fire protection will be provided by the airport's existing on-site firefighting system.

The conceptual distribution network will provide some level of fire protection; the ultimate level of protection will be determined in final design.

IMPLEMENTATION

The properties in Pellston have private wells and will be encouraged to connect to the public water system, if this alternative is implemented. Implementation of this alternative would take several years. This process would begin with the establishment of the well, water treatment plant, and storage tank. Water main will be needed to transport the water from the source to the treatment plant and storage tank. The distribution network would be installed (approximately 12.5 miles of water main), including valves and fire hydrants. The water would flow from the well source through the transmission lines to the treatment plant and storage tank. It would then be distributed through the water main in the Village. The Village would be classified as a Type I Community Public Water Supply based on the anticipated service area population discussed in the sections above. A Type 1 Community Public Water Supply provides year-round service to not less than 25 residents OR not less than 15 living units.

The general requirements for a Type I Public Water Supply are listed below:

1. Obtain certified operators of treatment and distribution systems.
2. Monitor for contaminants at prescribed frequencies.
3. Submit waterworks system operation reports and maintain records.
4. Comply with the provisions of Part 41 of Rule 325 – Safe Drinking Water Act.
5. Submit plans and specifications and obtain permits from EGLE in accordance with the provisions of the Safe Drinking Water Act and Part 13 of Rule 325.

To connect to each home, a service line would be installed from the water main to a curb stop box. From the curb stop box, additional service line would be installed to the home. The service line would connect into the existing plumbing at each property. In addition to the service line, a water meter would be installed at each home. Residents would have to complete an agreement with the Village for the installation of the service line and water meter on their private property.

G. COSTS

The total installation cost for this alternative is approximately $44,000,000. This is comprised of the following costs:

Item	Cost
Water Treatment Plant (chlorination and iron removal), Storage Tank, Wellsite Development	$17,300,000
Transmission main to distribution network	$3,000,000
Distribution Network	$22,300,000
Private Well Abandonment	$1,400,000
Total Cost:	**$44,000,000**

The total operations and maintenance costs for this alternative include costs for a WTP operator, fuel and chemicals for the WTP, testing, repairs, planning and other administrative costs and fees.

The O&M cost is estimated to be $382,530 per year. The annual cost could decrease slightly if fewer users connect. O&M breakdown is provided in Appendix E.

SUMMARY

The public water system via local municipal source alternative would be advantageous in comparison to the single home filtration alternative because it would be accepted as a long-term solution. If the municipal water system were established, the system would be anticipated to operate for many years before requiring major water

main replacements. The water would be properly treated and monitored without requiring an operator to enter homes on a regular basis. This alternative would not be impacted by the possibility of more private wells becoming contaminated with PFAS. A highly conservative factor of safety was considered when identifying the well location to avoid creating a wellfield that becomes contaminated. This alternative would centralize the operations and maintenance to one large water system, rather than monitoring over one hundred individual systems. This would minimize the residents' risk of PFAS exposure.

However, this alternative would take time to implement. The installation of a well, water treatment plant, storage tank, and distribution network would take years to complete. The system would require a team of employees to operate and maintain the system. This would include staff to operate the water treatment plant, submit reports and maintain records, and maintain the distribution network. Employees should be available to address problems that may arise with the system to minimize water service disruptions. The system would eventually require substantial maintenance and rehabilitation. A strategy should be established to determine the schedule and future funding source for this work. Residents would begin receiving water bills for their water usage. Residents may find this inconvenient, however, they would be released of the responsibilities associated with the future use of their well. The total installation cost for this alternative is $44,000,000.

VI. PUBLIC WATER SYSTEM VIA REGIONAL WHOLESALE PROVIDER

A. ALTERNATIVE OVERVIEW

As mentioned, the list of homes requiring POE systems will vary due to fluctuating concentrations. A public water supply would require less coordination with homeowners to perform ongoing maintenance and sampling. The public water system via regional wholesale provider alternative was investigated for the Village.

B. REGIONAL WHOLESALE PROVIDER EVALUATION

A regionalization alternative was evaluated for the Village of Pellston, involving the Village purchasing water from a nearby supplier. The two main variables for considering a supplier are distance from the Village and the possibility of adding connections along the way to share the cost. While the Village of Mackinaw City, the City of Cheboygan and the City of Petoskey are within range of the Village of Pellston, there is a lack of significant population density between each potential supplier and the Village of Pellston that could be potentially connected along the route. The City of Harbor Springs is the same approximate distance from the Village of Pellston, but offers a number of connection opportunities along the way. A high-level analysis of the City of Harbor Springs public water system's capacity was completed.

The City of Harbor Springs owns and operates a Type I public water system. The system is supplied byfour wells, has two 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 GPM and has a total capacity of 2,150 GPM. The existing maximum day usage is 1,231 GPM and the 5-year usage is projected to be 1,248 GPM. For the Village of Pellston, the estimated existing and 5-year maximum day usage is 161 GPM and 225 GPM, respectively.

An analysis was performed to assess the well capacity involving the Village of Pellston, McKinley Township, and Maple River Township. A new well would be needed to meet the maximum day demand.

Several municipalities are located along the route from Harbor Springs to Pellston and could have the opportunity to connect in the future. 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.

Further details of this analysis are available in Appendix F.

C. TRANSMISSION SYSTEM EVALUATION

The transmission system would extend from the edge of Harbor Springs to Pellston, totaling approximately 17.5 miles. The path would start at the eastern edge of Harbor Springs following M-119 and branch off to W Conway Rd. The path runs along W Conway Rd up to US-31 and then follows US-31 all the way up to Pellston. A high-level cost estimate for the transmission main from Harbor Springs to Pellston was completed. The water main would be 24-inch ductile iron for the entire length from Harbor Springs to Pellston. The conceptual layout included valves, which were estimated using the recommended frequency in Ten States Standards. However, there were not any fire hydrants, service lines, curb stop boxes, or water meters included in the transmission system estimate. The water main would be primarily installed using open cut installation. Some areas would require directional drilling, specifically where water main would cross M-119 and wetland areas. There are several items that would be impacted by the installation of the transmission main. These would include sidewalk, driveway, pavement, and aggregate base. Costs were estimated for budgeting purposes for construction engineering, geotechnical services, design, mobilization, traffic maintenance and control, soil erosion and sedimentation control, tree clearing, restoration, and wetland mitigation. Wetland seed mix was included in the estimate for restoration of the wetland areas. However, a full wetland delineation would have to be performed during design. Property acquisition and easement costs, utility conflicts, and tree clearing locations would have to be further investigated. The number of driveways impacted by water main installation along the route was estimated and the existing surface types of the driveways and roads within the project limits would have to be verified prior to construction.

The conceptual cost estimate for the transmission route from Harbor Springs to Pellston is approximately $79,600,000. The transmission main estimate does not account for connection of communities along the path to Pellston tying into the system or the costs for the distribution system or storage within Pellston. It also does not include the costs for booster stations along the path or an additional well. The estimate represents the costs for the transmission main from Harbor Springs to the proposed connection point at the southern end of the Village limits. The conceptual transmission route from Harbor Springs to Pellston for this alternative is shown in Figure 10.

D. VILLAGE DISTRIBUTION SYSTEM EVALUATION

The Village distribution system for the regional wholesale provider would use the same design referenced within the local municipal source alternative. This design is a conceptual water main layout that includes 6 and 8-inch

ductile iron water main with valves and fire hydrants. The valves and hydrants were added to the design using Ten States Standards. The layout includes ¾, 2, and 3-inch services on both the public and private side along with curb stop boxes and water meters. The water main extends to developed areas within the Village limits. Although the PLN airport is outside of Village limits, the layout includes the airport for tie-in to the system. Service lines were also added to the properties across from the airport. The water main would total approximately 12.5 miles and primarily be installed with open cut installation. Some areas would require directional drilling, including areas where water main crosses US-31 and along Lahti Lane. The water main layout is a conceptual design, primarily intended for cost estimating. A more detailed design would need to be completed prior to construction. Since the distribution system would be the same as referenced within the local municipal source alternative, the same impacts would result from system installation. These include impacts to sidewalk, driveways, pavement, and aggregate base, which were included in the cost estimate. The cost estimate also budgeted for mobilization, design, construction engineering, administration, geotechnical services, traffic maintenance and control, soil erosion and sedimentation control, restoration, and tree removal. Property acquisition and easements, utility conflicts, wetland delineation, and the existing road surface and driveways would have to be investigated prior to construction. Each of these items have associated costs that would need to be considered. The conceptual layout can be seen in Figure 8. The distribution system was estimated to cost $22,300,000 for water main, associated appurtenances, and restoration.

IMPLEMENTATION

If this alternative was implemented, Pellston residents would be encouraged to switch from their private wells to the public water supply. Implementation of this alternative would have many challenges. Connection to the existing water main in Harbor Springs would have to be established, along with an additional well. This would require a great deal of coordination with the City of Harbor Springs. This coordination would be ongoing as treated water would be purchased by the Village on a regular basis. The transmission main (approximately 17.5 miles) from Harbor Springs to Pellston would be installed along with booster stations. This would involve agreement with the municipalities along the route to install water main within their right-of-way. Additional coordination would be required if any water mains were to break or require maintenance. The distribution system within the Village (approximately 12.5 miles of water main) would be installed to transport the water to individual homes, requiring the same homeowner coordination as the local municipal source alternative. Installation of the distribution system within the Village would involve the same steps described for the distribution system in the local municipal source alternative mentioned in the sections above. System installation for this alternative would be a long process that would have many stages, all dependent on successful coordination with other entities. Implementation would become more complex if other municipalities along the route were to connect to the system.

COSTS

The costs for the public water system via regional wholesale provider were estimated. The conceptual cost estimate for the transmission main from Harbor Springs to Pellston is $79,600,000. This estimate does not account for booster stations, an additional well, or communities along the path tying into the system. The estimate represents the costs for the transmission main from Harbor Springs to the proposed connection point at the southern end of the Village limits. The costs for the distribution system were estimated to be

approximately $22,300,000. These costs do not include water storage within the Village. The cost for private well abandonment would be $1,400,000. Therefore, this alternative would cost approximately $103,300,000 for the transmission main and distribution network alone. There would be additional costs associated with the ongoing purchase of water by the Village from Harbor Springs. Residents would receive regular water bills based on their water usage.

G. SUMMARY

The public water system via regional wholesale provider alternative would serve as a long-term solution in Pellston. The residents of Pellston would receive clean and reliable drinking water without requiring frequent coordination for operations and maintenance, like the single home filtration alternative. This alternative would centralize operations and maintenance activities to one large system. This alternative would not require the establishment of a well and water treatment plant to serve the Village. As a result, this alternative would not require as much effort from the Village to maintain these assets. However, the large length of transmission main as well as the distribution network would result in ongoing operations and maintenance costs for the Village. Staffing would be required to maintain the system and there would be costs associated with purchasing drinking water from Harbor Springs. Future rehabilitation activities for the water main would require funding as well as coordination with Village residents and municipalities along the route. The primary disadvantages of this alternative are the extensive coordination and large expenses. The installation cost for this alternative is approximately $103,300,000 for the transmission route from Harbor Springs to Pellston and the distribution network within the Village.

VII. ALTERNATIVE COMPARATIVE ANALYSIS

A. ALTERNATIVE OVERVIEW

1. SINGLE HOME FILTRATION

There are advantages and disadvantages for each of the alternatives explored. The single home filtration alternative could be implemented earlier than the other alternatives. This alternative would only require coordination with the affected properties (158 locations) and would not cause traffic disruptions or Village-wide impacts. This alternative would have a minimal impact on the environment as systems would be installed where existing wells are located. The use of POE systems would be an improvement in comparison to the POU filters being used in the Village currently. However, as mentioned, this alternative would not be accepted by EGLE as a long-term solution. Long-term use of this alternative would result in complicated maintenance and filter replacement schedules. System operators would be routinely coordinating with homeowners and entering homes to perform sampling, resulting in high maintenance costs. Another aspect of this alternative is that the absolute number of impacted properties is in flux because plume delineation is ongoing. Installation and operations and maintenance costs would increase if more wells became contaminated and required filtration units. As mentioned, the EPA MCLs, quarterly monitoring approach, and Culligan pricing will be referenced for cost comparison purposes. Installation for this alternative was estimated to cost $1,341,400 to install systems at the 158 properties in Pellston where PFAS has been detected. Operations and maintenance for 158 systems was estimated to cost $1,284,528 per year.

2. PUBLIC SYSTEM VIA LOCAL MUNICIPAL SOURCE

The public water system via local municipal source alternative would take longer to implement in comparison to the single home filtration alternative. This alternative would require coordination with the owners of the developed property in the Village, as each would receive a service line. There are also areas where the water main would cross through private property and easements would be obtained. However, in comparison to the regional wholesale provider and single home filtration alternatives, it would require less coordination. Although this alternative would result in water usage bills for residents, the water would be treated in accordance with state standards and monitored by professionals without entering individual homes on a routine basis. This would eliminate the use of many private wells and result in one large system, centralizing operations and maintenance. It would also eliminate the need to add more treatment systems in Pellston if additional private wells were to become contaminated. Each home would be given the opportunity to connect to the distribution network and receive clean and reliable water, regardless of the status of their private well. The wellfield location was selected using a conservative factor of safety to minimize the possibility of future PFAS contamination. This alternative would cause greater traffic disruptions in comparison to the single home filtration alternative. Lane and road closures would occur throughout the Village as the distribution system was installed. Installation has the potential to produce noise and dust and trees would need to be cleared. This alternative has a total cost of $44,000,000 with an annual O&M cost of $382,530.

3. PUBLIC WATER SYSTEM VIA REGIONAL WHOLESALE PROVIDER

The public water system via regional wholesale provider shares several advantages and disadvantages with the local municipal source alternative. Implementation would take longer than the single home filtration alternative as water main would be installed from Harbor Springs to Pellston along with the entire distribution network within Pellston. This alternative would also reduce unexpected costs due to additional private wells becoming contaminated with PFAS, compared to the single home filtration alternative. The regional wholesale provider alternative varies from the local municipal source alternative by connecting to an existing system. As a result, this alternative would not require the establishment of a well or water treatment plant. This would minimize future operations and maintenance responsibilities and costs related to those assets. However, the water would have to be purchased from Harbor Springs, and two booster stations and an additional well would be installed. This alternative would also initiate water bills for residents, similar to the local municipal source alternative. Another aspect of this alternative is the transmission main from Harbor Springs to the Village. The transmission main along the route would total approximately 17.5 miles, resulting in a large installation cost, and this water main would eventually require rehabilitation. This alternative would require coordination with Harbor Springs and with each ofthe municipalities along the route. This would include Little Traverse Bay, Conway, Oden, Ponshewaing, Alanson, and Brutus. Each of these municipalities would have to allow transmission main to be installed within their right-of-way to successfully complete the route from Harbor Springs to Pellston. Service line

and water meter installation would require coordination with the owners of the developed property in Pellston. Easements would be required for several locations where water main would cross through private property. This alternative would cause traffic disruptions along the route and within the Village. These construction activities have the potential to produce noise and dust and trees would be cleared as a part of installation. There are several wetland areas located along the route from Harbor Springs to Pellston and the wetlands would be mitigated and restored with wetland seed mix during construction. The installation cost for this alternative is approximately $103,300,000 for the transmission route from Harbor Springs to Pellston, the distribution network within the Village and abandonment of private drinking wells.

B. RECOMMENDATION

From the alternative analysis, it was determined that the public water system via local municipal source option is the most feasible for providing safe and reliable drinking water to the Village. Although the single home filtration alternative has lower implementation costs, its long-term operation and maintenance expenses are high, and managing these systems is challenging. EGLE does not prefer these systems as a long-term alternative for drinking water systems and they would best serve as an interim measure while a long-term solution is being established. The regionalization alternative presents stakeholder and timing challenges, along with excessively high costs. Therefore, it is recommended that the Village pursue a public water system sourced from a public well near the Village limits. Detailed cost estimates can be found in Appendix G.

VIII. STAKEHOLDER ANALYSIS

A. STAKEHOLDER IDENTIFICATION

The public water system via local municipal source alternative was determined to be the most feasible option for providing clean drinking water to Village residents. The implementation of this alternative would impact numerous stakeholders with different levels of involvement in the project. Through the installation of the water system, the Village will become responsible for the operations and maintenance of these assets. The Village will be responsible for ensuring the water treatment plant meets Statestandards and addressing problems that may arise with the system. A team of staff will need to be established to operate the water treatment plant and monitor the entirety of the public water system. Installation will cause traffic disruptions and require coordination throughout the Village. Pellston residents will also be a primary stakeholder. Residents will receive service lines on their private property along with a water meter. Residents will need to complete an agreement with the Village for these assets to be installed on their property. There are many private wells throughout the Village that have PFAS concentrations that exceed both state and federal standards. Since residents are suspected to be using the POU filters improperly, they could be ingesting PFAS and potentially experience the effects of exposure. Through the implementation of this system, their risk exposure for PFAS will be minimized. The distribution network will include fire hydrants placed according to Ten State Standards. These fire hydrants will be there for fire department use in case of an emergency. Residents will likely experience impacts from construction, including lane and road closures as well as noise and dust. Business owners in the Village will also experience these impacts. Coordination with Pellston Middle/High School, Pellston Elementary School, Pellston Fire Department, as well as affected businesses will be necessary for construction. Additionally, Pellston

Schools own the property chosen for the well location. Both residents and business owners could experience short term service disruptions when service is switched to the new service line. EGLE would regulate the public water system established in Pellston.

B. STAKEHOLDER CONCERNS

After the public water system is implemented, residents will be charged for their water usage and will receive water bills on a regular basis. However, residents will no longer have to operate and maintain their private wells for future use. This will eliminate costs for residents regarding maintenance tasks and the electricity used to operate their well. Residents will no longer have to worry about their well drying up or the quality of water coming from it. Residents and business owners would continue to have water access during power outages without the need to run a private generator. Traffic and service disruptions will be minimized through strategic work schedule planning. To minimize impacts to the environment and public, necessary permits will be obtained prior to construction and construction standards will be adhered to. This project is intended to protect public health and improve the reliability of safe drinking water in the Village.

C. ENGAGEMENT PLANS

The Village applied for FY 2026 DWSRF funding to design and construct a public water system via local municipal source. As a part of the application process, a formal public meeting was held on May 12, 2025, for public consultation and participation. The Village Council passed a resolution to formally adopt the DWSRF project plan and implement the selected alternative following the public meeting. Through this process, questions were addressed, and a better understanding of the project was gained by the public. The finalized Intended Use Plan includes the Village of Pellston as eligible for a funding of a municipal water treatment system.

Four public meetings to discuss the proposed water system were held in November 2025. A village-wide survey was launched in November to solicit interest in connecting to the new public water system. As of December 17, 2025, approximately 55% of properties with active wells had agreed to connect to the new system. Figure 7 shows results of the survey.

IX. FINANCIAL ANALYSIS

A. FUNDING OPTIONS - PLANNING

1. WIIN GRANT

The Village is performing a drinking water feasibility study funded with a WIIN grant by EGLE through the EPA. According to the EPA, the WIIN Act establishes the Small, Underserved, and Disadvantaged Communities (SUDC) grant. This grant awards funding to states, territories, and tribes to assist public water systems in meeting Safe Drinking Water Act requirements.

Through the WIIN grant, the goal is to supplement as much of the planning and design costs with the money remaining from the study to position the Village for FY 2026 DWSRF funding. However, WIIN funding can't support the entirety of this project since it is such a large-scale planning and design project.

2. AP GRANT

The costs associated with planning, design, and construction for a project this large are exceedingly high. This would have posed a significant financial burden on the community if additional grant funding had not been secured. The Village was awarded an AP Grant through EGLE. According to EGLE, the AP grant is designed to provide funding to address water infrastructure needs across Michigan as part of EGLE's Clean Water Plan. Pellston was second on the priority list of AP Grant applicants.

With the AP grant, the Village has had more resources to position them for FY 2026 DWSRF funding. Prior to submittal of the Intent to Apply (ITA) and DWSRF project planning document, the goal was to perform as much planning and design as possible with this additional funding. As a result, less design work was needed in order to secure the DWSRF grant for FY 2026. The Village intends to achieve the following objectives with this funding: support planning and designing a municipal water system, perform a regionalization analysis, perform a preliminary rate study, and develop a DWSRF project planning document and application.

B. FUNDING OPTIONS – DESIGN AND CONSTRUCTION

1. STATE REVOLVING FUND AND RRD

The Village has completed this feasible study for providing safe and reliable drinking water. The Village investigated the alternatives previously stated, including single home filtration, establishment of a public water supply, and regionalization. Each alternative was evaluated in terms of how the contamination issues in the Village can best be addressed using future resources. However, each alternative has costs and benefits. While the public water supply would require water bill payments, the single home filtration alternative would require constant maintenance and ongoing sampling to assess the need for new filtration systems throughout the Village, which also comes with a high cost. As a result, EGLE encouraged the Village to establish a municipal water system and apply for DWSRF to seek funding to design and construct a municipal water system in FY 2026. The Village was awarded this funding in November 2025 with 100% principle loan forgiveness and is ready to move forward with design and construction. Additionally, the Village was granted additional funds through an RRD grant.

Michigan's DWSRF is a program operated by EGLE. It is designed to assist water suppliers in satisfying the requirements of the Safe Drinking Water Act by offering low-interest loans to eligible water suppliers. The Final Intended Use Plan includes funding for the municipal water system for the Village of Pellston.

Applicant Eligibility

The DWSRF Eligibility Guidelines state that the following water suppliers are eligible to participate in the program:

- *A community water supply.*

- *A noncommunity water supply that operates as a nonprofit entity.*

The EPA issued a decision for the DWSRF program that would allow the creation of new community water systems through loans from states as part of the program. Additionally, the New System Eligibility procedure allows community water systems to be created to address public health problems caused by unsafe drinking water that is supplied by surface water sources or individual wells.

Project Eligibility

The DWSRF Eligibility Guidelines state that water supplies must comply with all program requirements and exhibit the following:

- *The project is needed to assure maintenance of, or progress towards, compliance with the federal Safe Drinking Water Act [MCL§324.5405(3)].*
- *While planning, feasible project alternatives were evaluated [MCL§324.5405(4)].*
- *The requirements set in Part 54 are met by the alternative proposed for construction [MCL§324.5405(5)].*
- *The project can be built, operated, and maintained by the water supplier and they have the legal, institutional, technical, financial, and managerial capacity to do so [MCL§324.5409(1)(d)].*
- *The water supplier does not have any outstanding prior-year fees under MCL§325.1011a or §325.1011b*

The Village was eligible to apply for DWSRF as they meet all the program requirements listed above. As mentioned previously, the Village is considered overburdened by EGLE based on their median annual household income and taxable value per capita.

C. RATE STUDY

OHM Advisors worked with a subconsultant, Bendzinski & Co, to evaluate rate impacts to Village residents for the public water supply system via Public Municipal Source. These results can be found in **Appendix H**: Rate Study Report.

X. CONCLUSION

A. SUMMARY OF FINDINGS

The Village of Pellston does not contain public drinking water utilities and residents and business currently operate using private drinking water wells as their water supply. In and around the Village, PFAS has been identified in the wells at 158 properties. Many of these locations contain concentrations that exceed both EGLE and EPA drinking water standards for PFAS compounds. However, the number of properties with PFAS detections and MCL exceedances will continue to fluctuate due to potential for plume migration. As a result, three alternatives were investigated. The single home filtration alternative would require frequent coordination with homeowners for operators to enter homes to sample and perform maintenance on the systems. Since the

number of wells containing PFAS in the Village could change frequently due to fluctuating concentrations, the number of systems required is subject to change. These factors all contribute towards substantial operations and maintenance costs associated with this alternative. As a result, this alternative would not serve as a long-term solution for the Village.

The public water system via local municipal source alternative was also explored. Through this alternative, the public water system would be properly maintained without an operator frequently entering homes and would not be impacted by the possibility of more private wells becoming contaminated with PFAS. This alternative would centralize operations and maintenance in one large system and would minimize the risk of PFAS exposure to residents. This alternative would be a long term solution to the PFAS contamination issue. However, this alternative would take years to implement and require staff to operate and maintain the system. Residents would receive a water bill on a regular basis through this alternative but would no longer operate their own private well and risk PFAS exposure.

The final alternative investigated was the public water system via regional wholesale provider alternative. This alternative would also be operated and maintained as one large system. This alternative would not require operators for the water treatment plant like the local municipal source alternative would. However, there would be ongoing operations and maintenance associated with the large length of transmission main, booster stations, and distribution network. The drinking water would be purchased from Harbor Springs and residents would receive water bills on a routine basis. The primary impact of this alternative would be the extensive coordination required between municipalities and residents to install the system and maintain it.

B. RECOMMENDATION

Through the performance of the alternative analysis, it was determined that the public water system via local municipal source is the best option for providing safe and reliable drinking water to the Village. The single home filtration alternative has lower implementation costs but operations and maintenance is complicated long term, so it would only serve as a temporary solution. This alternative could be used to provide residents with a higher level of service until a long-term solution is implemented. Both public water system alternatives would be long term solutions. While the local municipal source alternative would still have significant costs, they would be reduced in comparison to the large trasnmission costs associated with the public water supply via regional wholesale provider alternative. The regional wholesale alternative also presents more stakeholder and timing challenges. In conclusion, the best option for the Village is the public water system via local municipal source. This alternative is estimated to cost $44,000,000 total. The Village has been approved to receive grant money through the DWSRF program and an EGLE RRD Grant to design and construct the public water system.

Appendix A

Figures

Figure 1: Area of Interest

Figure 2: EGLE PFAS MCLs and the Proposed EPA PFAS MCLs

Figure 3: Topography and Land Cover

Figure 4: Zoning Map, Village of Pellston

Figure 5: Anticipated Growth Timeline

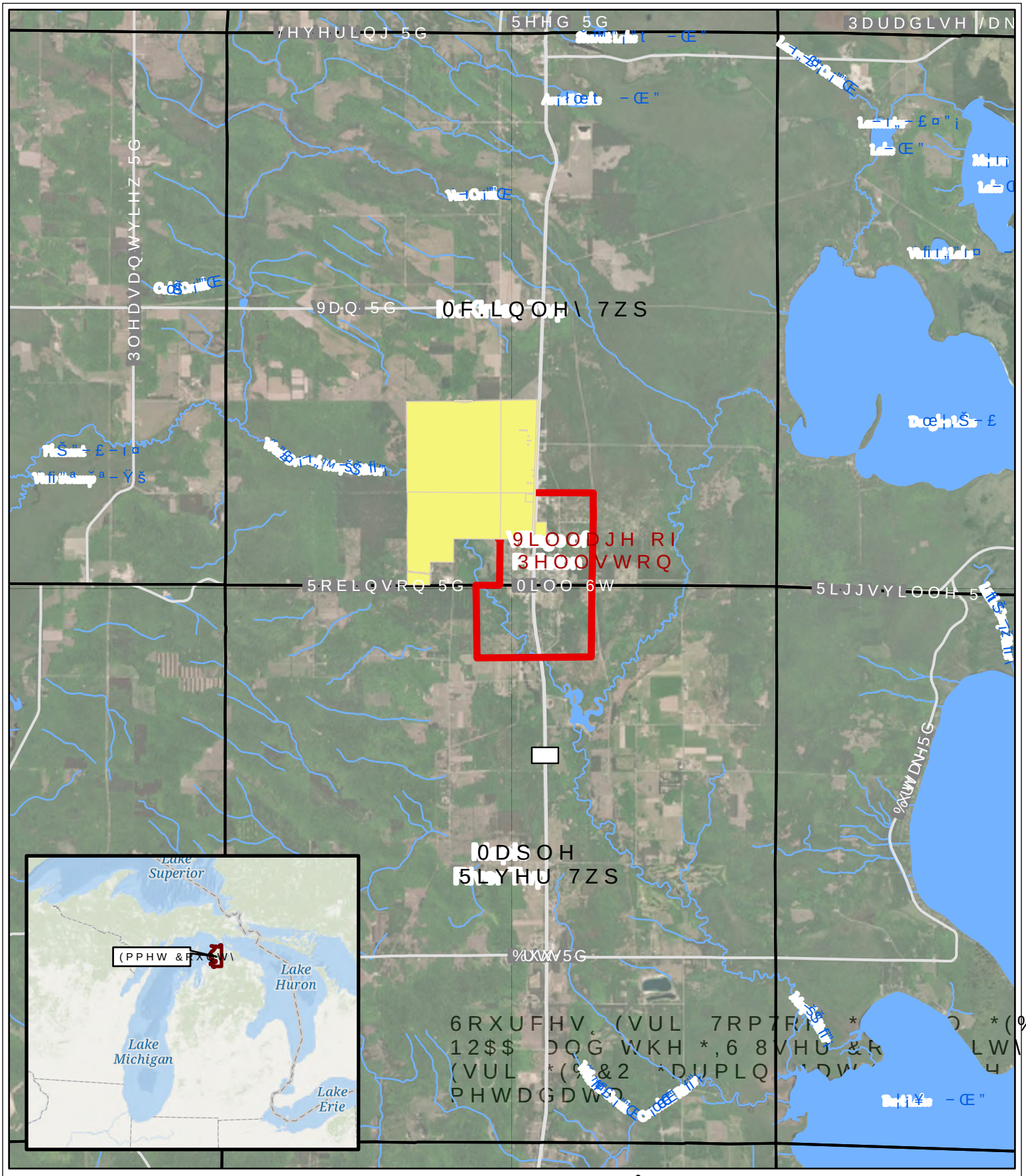
Figure 6: REU Estimates

Figure 7: Survey Responses 12/17/2025

Figure 8: Concept Distribution System

Figure 9: WTP Concept

Figure 10: Alternative 3 Layout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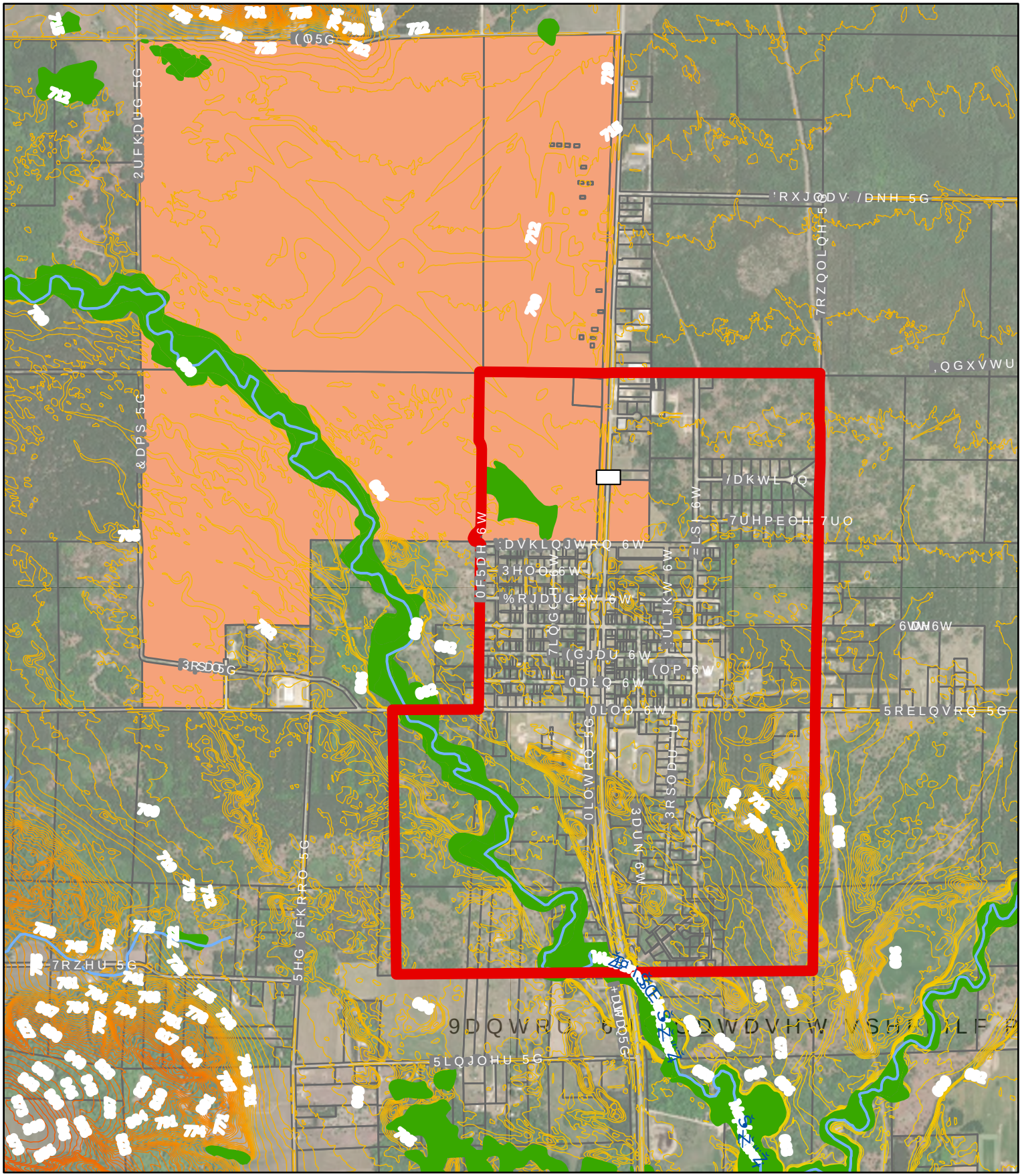
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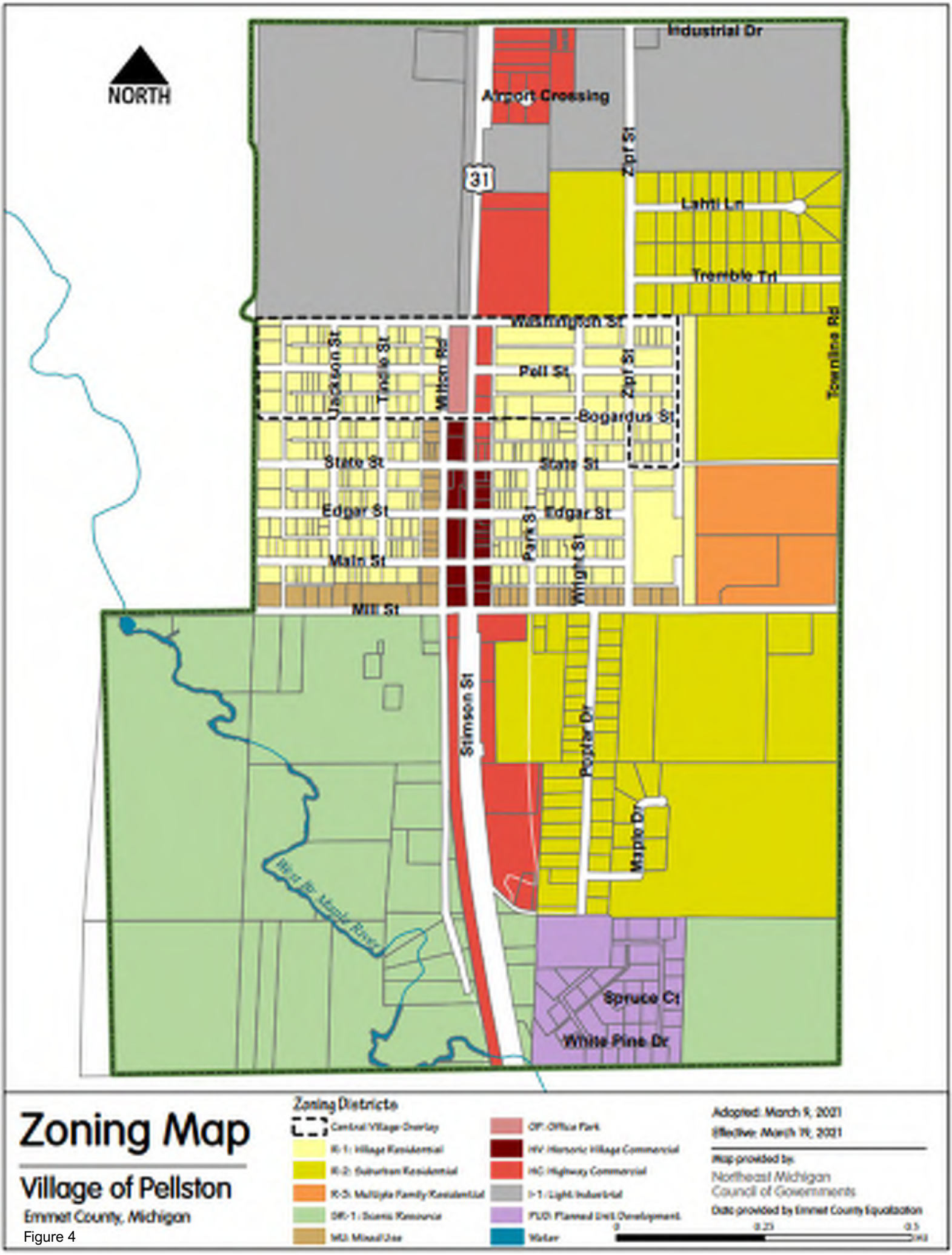
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Zoning Map
Village of Pellston
Emmet County, Michigan
Zoning Districts
Central Village Overlay
R-1: Village Residential
R-2: Suburban Residential
R-3: Multiple Family Residential
OR-1: Scenic Resource
MU: Mixed Use
OP: Office Park
HV: Historic Village Commercial
HC: Highway Commercial
I-1: Light Industrial
PUD: Planned Unit Development
Water
Adopted: March 9, 2021
Effective: March 19, 2021
Map provided by:
Northeast Michigan Council of Governments
Data provided by Emmet County Equalization
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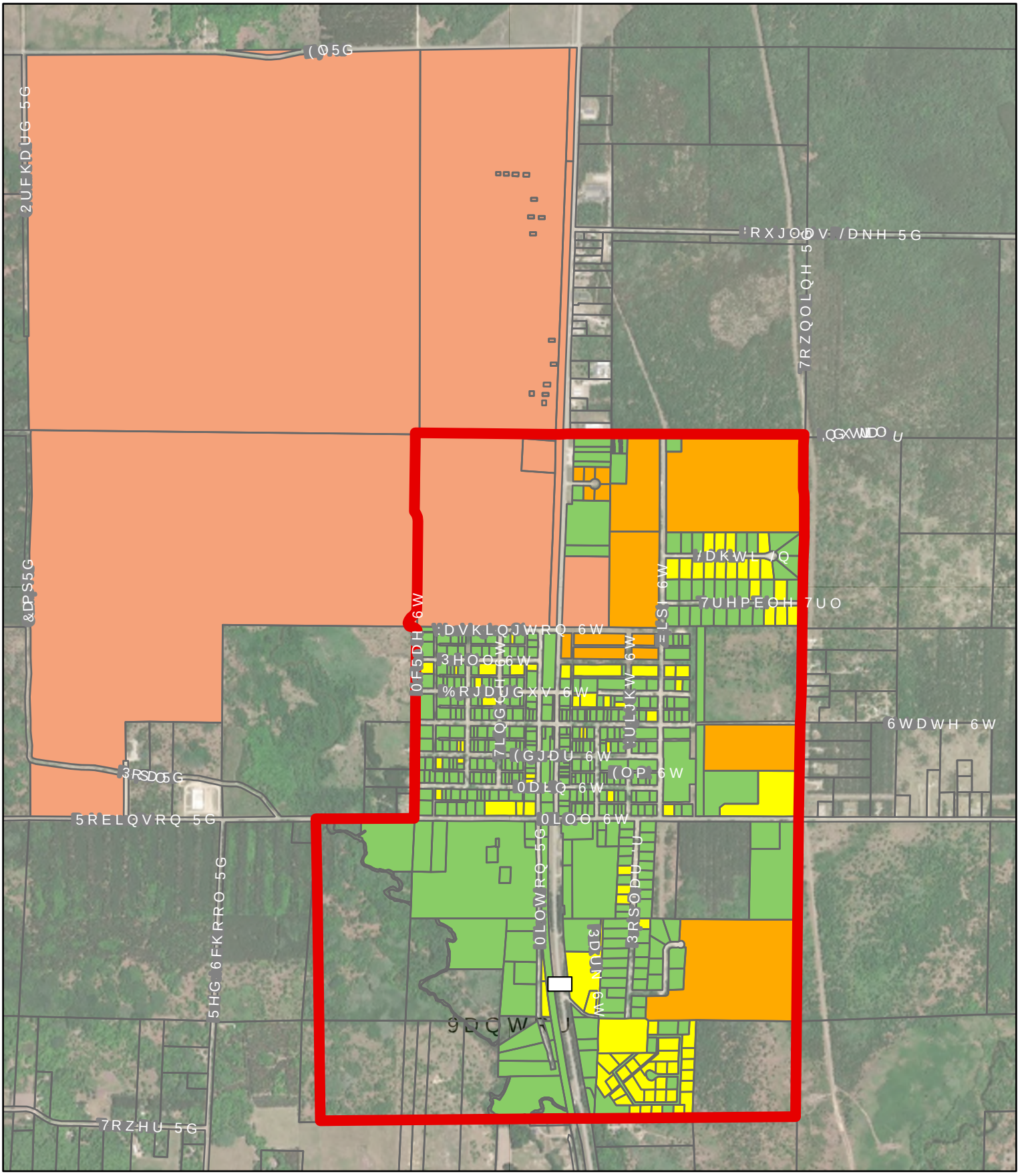
Figure 4



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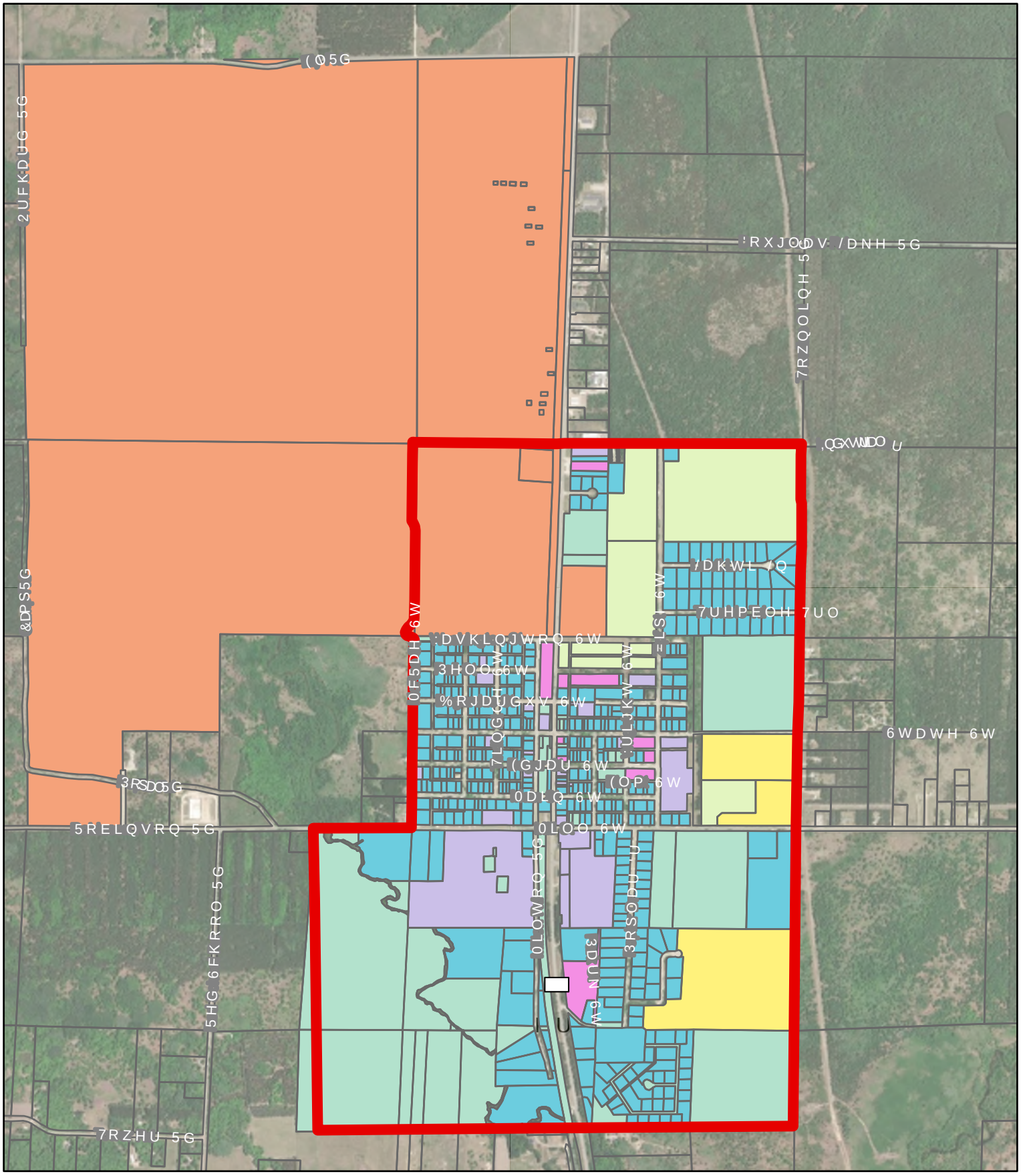

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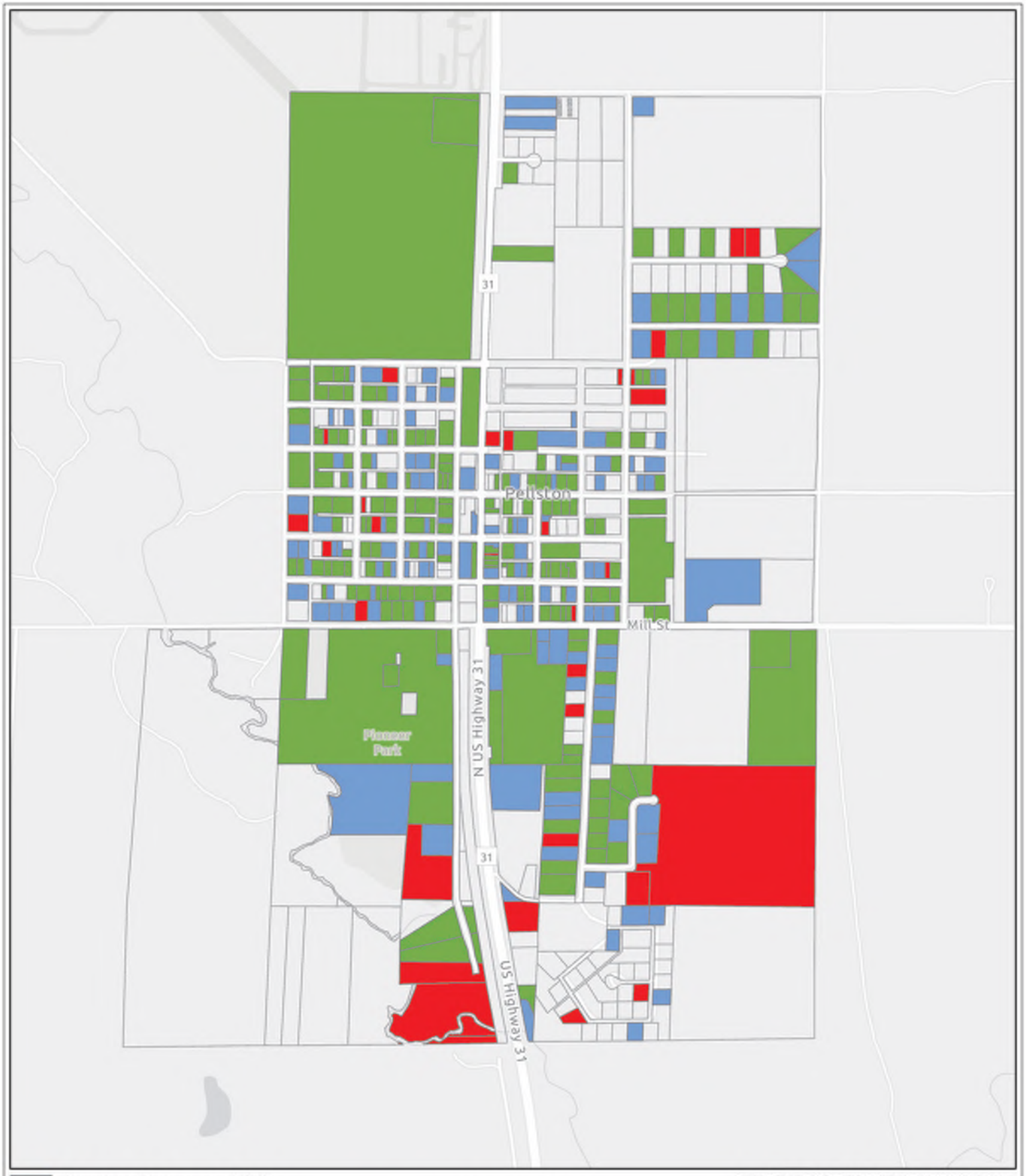

Pending Response (130)
No (30)
Yes (193)

Figure 7
Survey Responses 12/17/2025

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Feet
1" = 1,250'

Source: Data provided by Village of Pellston and Esri. OHM Advisors does not warrant the accuracy of the data and/or the map. This document is intended to depict the approximate spatial location of the mapped features within the Community and all use is strictly at the user's own risk.

Coordinate System:
Name: NAD 1983 StatePlane Michigan Central FIPS 2112 Feet Intl

Map Published: December 17, 2025

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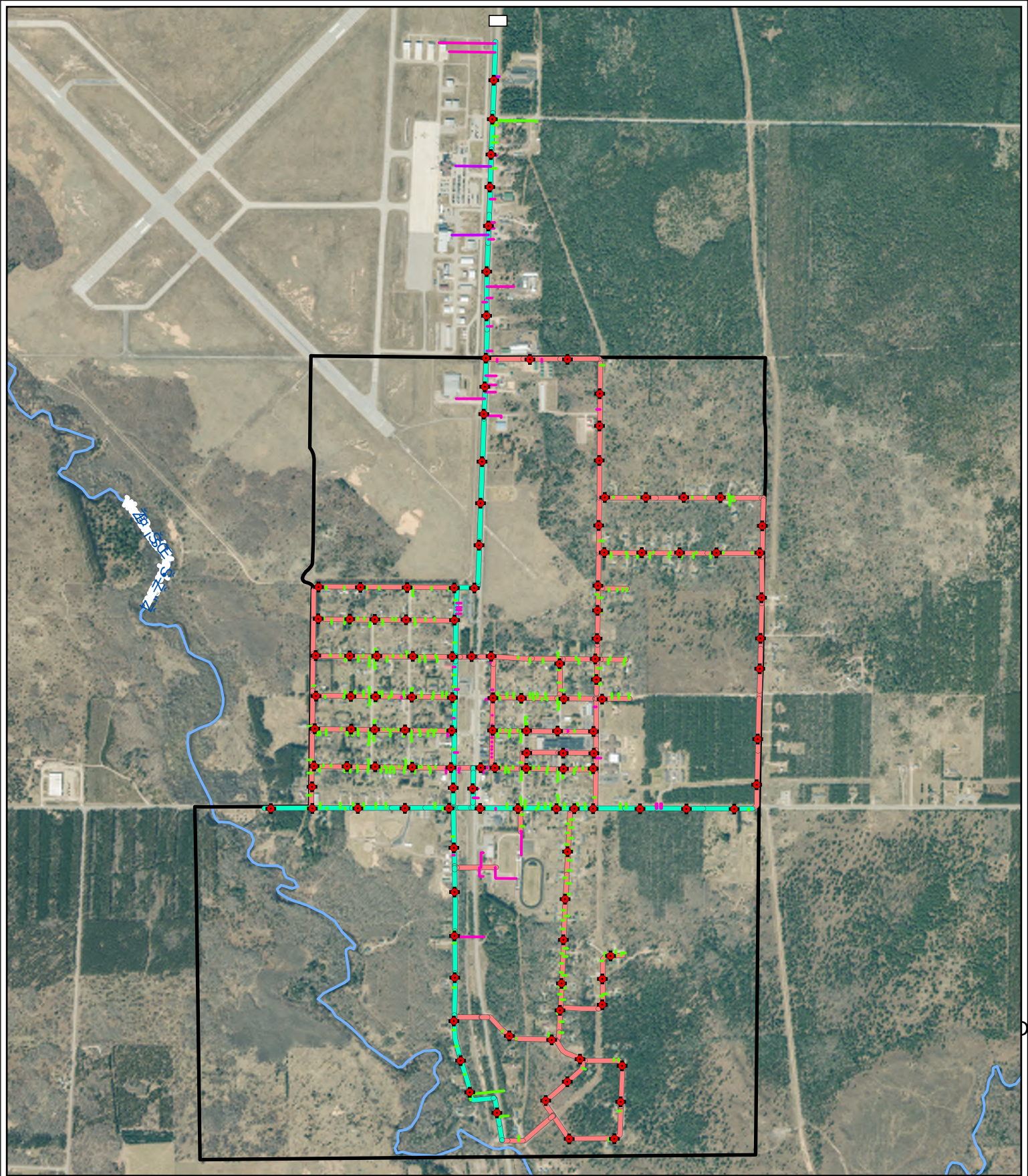
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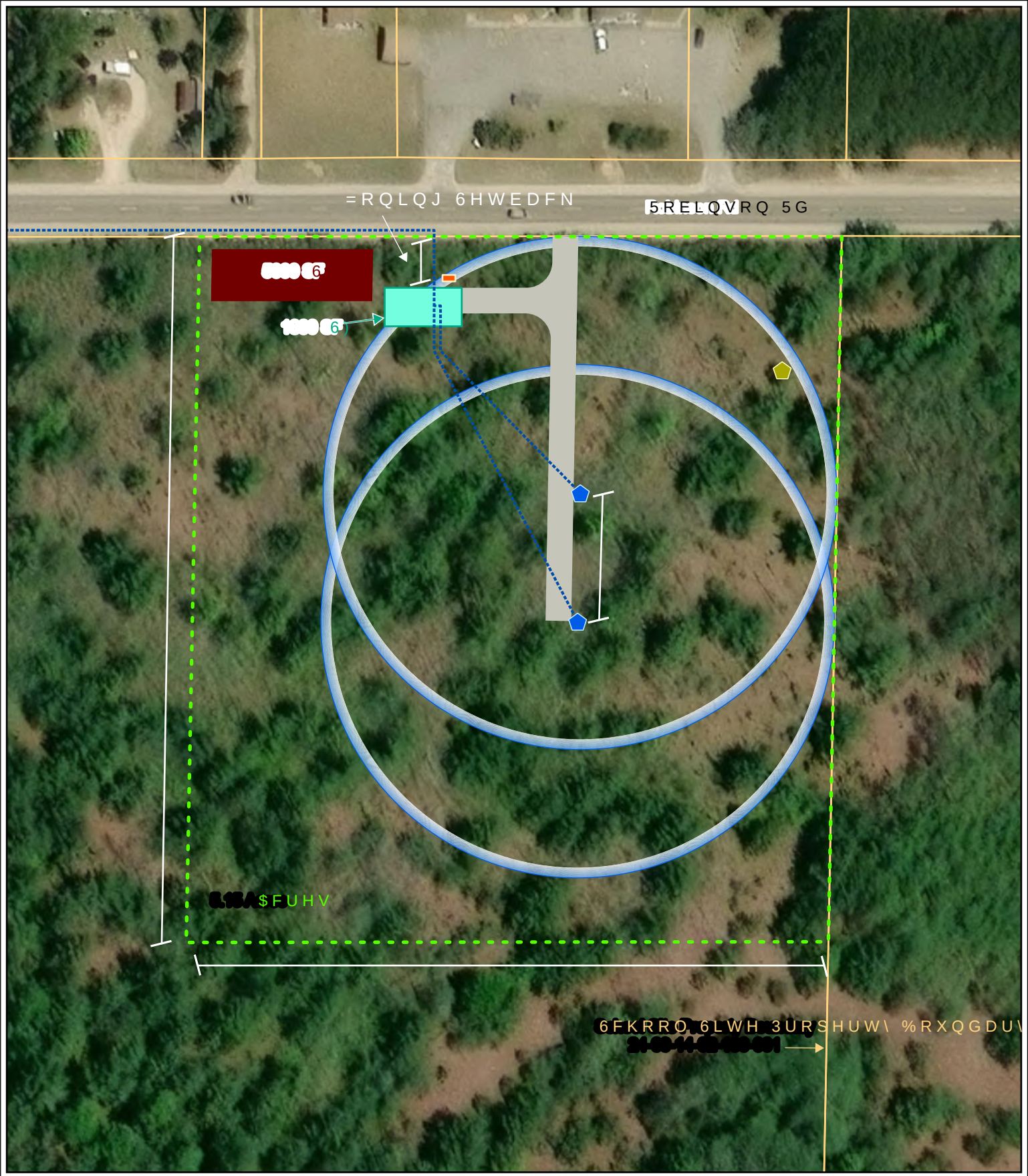

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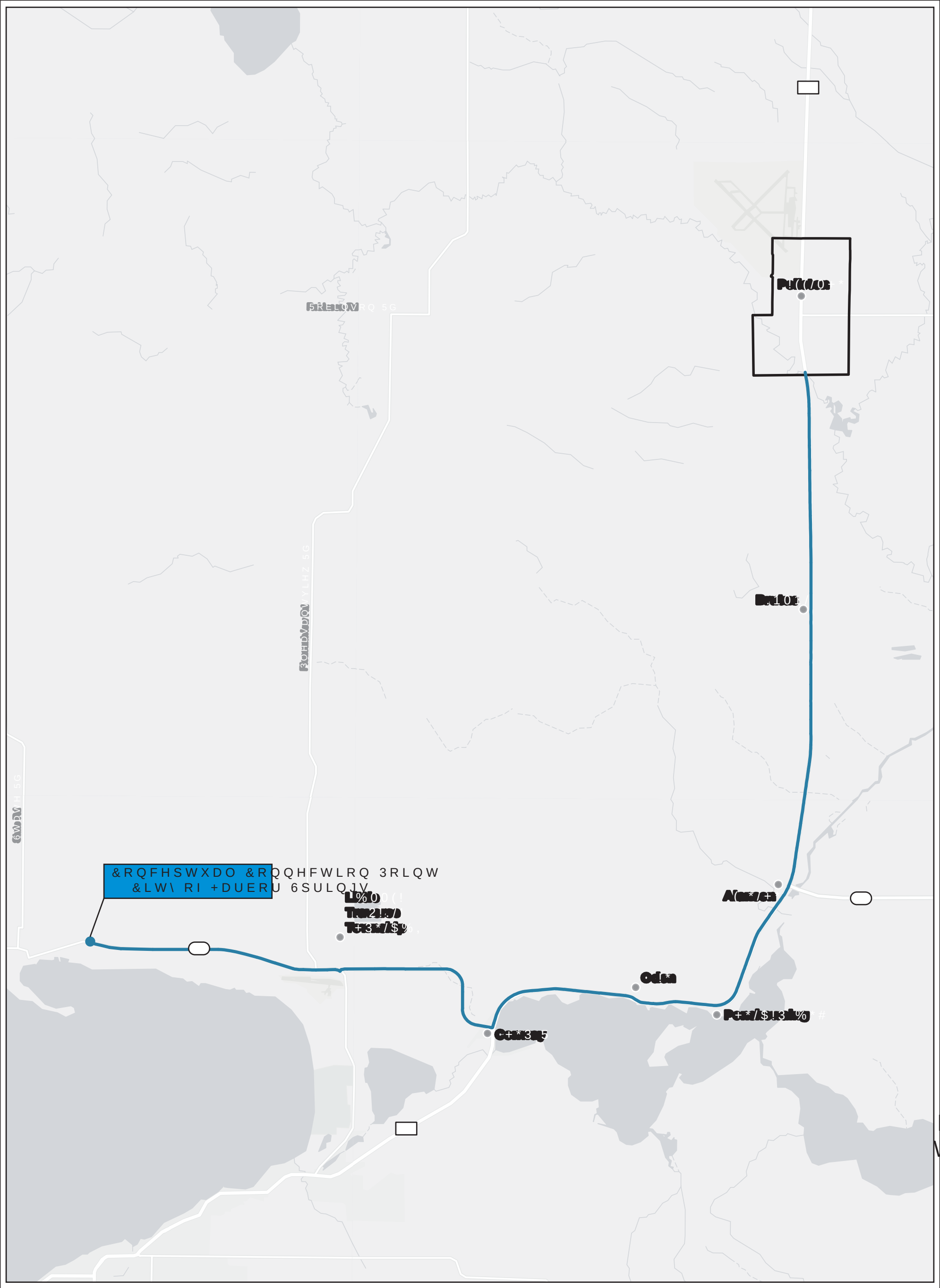

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Appendix B

Alternative 1: Single Home Filtration Alternative Analysis

memorandum

Date: April 19, 2024

To: James Gillet, Village President and Rebecca O'Neil, Village Clerk: Village of Pellston
cc:
From: Karlin Danielsen, Steve Warren, Susan Knepper, Skyler Kruger: OHM Advisors

Re: Village of Pellston Single Home Filtration Alternative Analysis

Background

The Village of Pellston is located in Northern Michigan and had a population of 774 at the time of the 2020 Census. Per- and polyfluoroalkyl substances (PFAS) contamination was identified in private drinking water wells south of the Pellston Regional Airport. The identified source of this contamination is the aqueous film-forming foam (AFFF) that was used during training and emergency response activities at the airport. The Michigan Department of Environment, Great Lakes, and Energy (EGLE) and Michigan Department of Health and Human Services (MDHHS) have been sampling the wells in Pellston and identified the locations with concentrations exceeding the EGLE Maximum Contaminant Levels (MCLs) for PFAS. Pellston residents have been given point of use filters, but the public has not been satisfied with the low flow rate of 0.7 gallons per minute (GPM) from the filters. There are also concerns that residents are not replacing filters following MDHHS guidelines and/or disconnecting them due to the low flow rate they provide. As a result, alternative solutions were investigated for the Village of Pellston, including Point of Entry (POE) systems. POE systems are whole home filtration systems that treat all the water that enters a residence. These systems could be used as an interim measure to treat the water in Pellston until a long-term solution is identified. A full analysis of the application of POE systems in Pellston to address PFAS contamination was performed.

Of the 217 wells that were sampled through August of 2022, PFAS has been detected in 124 wells in Pellston in varying concentrations. Currently, 57 of those wells contain concentrations of PFAS that exceed the EGLE Maximum Contaminant Levels. The United States Environmental Protection Agency (EPA) has established national drinking water standards for PFAS at lower concentrations than the EGLE MCLs. Using the EPA MCLs, there are currently 87 wells that exceed the maximum concentrations. A map of the homes that would require filtration to meet the EGLE MCLs and EPA MCLs is shown in Figure 1. These wells contain amounts of PFAS ranging from just over the regulations to substantially greater than the maximum allowable concentrations. The absolute number of households in Pellston that would need filtration units is in flux because plume delineation is ongoing and the PFAS regulatory framework is evolving.

Regulatory Framework

Federal Maximum Contaminant Levels

On April 10, 2024, the EPA announced the final National Primary Drinking Water Regulation (NPDWR) for six PFAS including perfluorooctanoic acid (PFOA), perfluorooctane sulfonic acid (PFOS), perfluorononanoic acid (PFNA), hexafluoropropylene oxide dimer acid (HFPO-DA, commonly known as GenX Chemicals), perfluorohexane sulfonic acid (PFHxS), and perfluorobutane sulfonic acid (PFBS). The EPA also established health-based, Maximum Contaminant Level Goals (MCLGs) for these six PFAS. While the MCLGs are non-enforceable, they set public expectations for water treatment goals.

The five PFAS; PFOS, PFOA, PFHxS, PFNA, and HFPO-DA have compound specific EPA MCLs. The EPA MCLs for PFOS and PFOA are each set at 4.0 parts per trillion (ppt) and the other three compounds, PFHxS, PFNA, and HFPO-DA are set at 10.0 parts per trillion (ppt), as shown in Table 1. Mixtures containing two or more of PFHxS, PFNA, HFPO-DA, and PFBS will be regulated with a combined Hazard Index. A Hazard Index greater than 1.0 would be considered an MCL violation. The Hazard Index is calculated by a sum of the ratios of individual compounds:

$$Hazard\ Index = \frac{PFHxS\ (ppt)}{10\ ppt} + \frac{PFNA\ (ppt)}{10.0\ ppt} + \frac{GenX\ (ppt)}{10.0\ ppt} + \frac{PFBS\ (ppt)}{2000\ ppt}$$

Table 1. EPA PFAS MCLs and MCLGs

Compound	Final MCLG (ppt)	Final MCL (ppt)
PFOA	Zero	4.0
PFOS	Zero	4.0
PFHxS	10.0	10.0
PFNA	10.0	10.0
HFPO-DA (commonly referred to as GenX Chemicals)	10.0	10.0
Mixtures containing two or more of PFHxS, PFNA, HFPO-DA, and PFBS	1.0 (unitless) Hazard Index	1.0 (unitless) Hazard Index

EGLE MCLs

States are required to enforce federal MCLs but also have the authority to establish drinking water MCLs that are more stringent than the Federal levels. EGLE completed the process of promulgating rules to establish MCLs for seven PFAS compounds in 2020. EGLE regulates Perfluorohexanoic acid (PFHxA) in addition to the six regulated by the EPA (PFOA, PFOS, PFNA, PFHxS, PFBS and HFPO-DA). The Michigan PFAS MCLs are shown in Table 2.

Table 2. Michigan PFAS MCLs

Specific PFAS	Drinking Water MCL (ppt)
PFNA	6
PFOA	8
PFHxA	400,000
PFOS	16
PFHxS	51
PFBS	420
HFPO-DA	370

The Michigan MCLs are currently the only standards in place regulating PFAS compounds in Michigan public drinking water systems. The EGLE MCLs are compound specific, and not interrelated as in the EPA Hazard Index. Any exceedance of a single EGLE MCL is considered a violation of that MCL.

The project team had conversations with EGLE members regarding POE (Point of Entry) systems connected to private wells. A detailed summary of that conversation is available in Appendix A. In summary, EGLE does not prefer POE systems a long-term alternative for drinking water systems because long-term use is complicated. Residents can remove the filters or deny access for maintenance or EGLE MCL compliance checks. EGLE would be willing to accept POE systems as a short-term alternative while a public water supply system is under design and construction. The short-term alternative would only be acceptable to EGLE if the POE systems were operated and maintained by a qualified operator.

Public Water Supplies

"A classification system for public water supplies is established under the Michigan Safe Drinking Water Act, 1976 PA 399, as amended (Act 399), being MCL 325.1001 et seq. (Act 399 Rules), and the administrative rules promulgated thereunder, being R 325.10101 et seq. Public water systems are classified by the population served or the nature of their customer base" (EGLE, 2023).

Classification	Description	Examples
Type I Community Water Supply	Provides year-round service to not less than 25 residents OR not less than 15 living units.	Municipalities, Apartments, Condominiums, Nursing Homes, Mobile Home Parks
Type II Nontransient Noncommunity Public Water Supply	Serves not less than 25 of the SAME people for at least six months per year.	Schools, Industries, Places of Employment
Type II Transient Noncommunity Public Water Supply	Serves not less than 25 people OR not less than 15 connections for at least 60 days per year.	Hotels and Restaurants (with less than 25 employees), Campgrounds
Type III Public Water Supply	Anything not considered a Type I or Type II water supply; serves less than 25 people AND 15 connections, or operates for less than 60 days per year.	Small Apartment Complexes and Condominiums, Duplexes, All Others

In cases where the state holds the primary authority to enforce regulations for public water systems, the state may define a public water system. Therefore, some state definitions of what constitutes a public water system vary from the EPA's definition. In the state of Michigan, a well becomes a Public Water System if it provides year-round service to not less than 25 residents OR not less than 15 living units.

All water quality regulations established by the EPA must be enforced by state departments of environmental quality, including EGLE. States have the authority to establish regulations that are more stringent than the federal levels but must at a minimum enforce the federal standards. State and federal drinking water quality regulations apply to public water systems.

Private Water Wells

The EPA and EGLE do not regulate the water quality in private wells, nor do they provide recommended criteria or standards for individual wells. The federal and state regulatory frameworks would only apply to water quality in the Village if they formed a public water system. Under the present circumstances, homeowners drawing water from private wells have the choice to comply with state and federal regulations as they see fit.

Point of Entry Systems

Advantages and Disadvantages of POE Systems

Point of Entry systems have several advantages in comparison to other methods of treatment. POE systems present less risk when implemented in households in comparison to POU (Point of Use) systems. POU systems are water filtration systems that connect directly to one singular fixture in a home. POE systems are installed by a licensed professional and treat all the water that enters a home. POE systems can treat large amounts of water each day. For example, a POE system can produce 8 GPM of treated water compared to the 0.7 GPM presently being provided by the POU systems in place. All the water used throughout the house is filtered, which reduces the risk of inhaling PFAS compounds volatilized during showering, provides clean water for garden irrigation, and can help preserve appliances as well as plumbing. Another advantage of POE systems is they remove PFAS compounds from water, so these compounds do not enter the septic field. The septic fields in Pellston are primarily sand soil systems and PFAS can continue to circulate in the soil of the region, creating further contamination. In order to treat PFAS concentrations consistently, it is required that maintenance and sampling are performed by a licensed operator and completed regularly. This mitigates the possibility of a homeowner removing the system or using it improperly. In comparison to a public water system, the installation of POE systems can be easily completed while a long-term solution is being developed. As a result, POE systems are being investigated as a temporary solution.

However, there are disadvantages of the application of POE systems. As mentioned, POE systems would require an operator to enter households to not only install the system but to maintain and sample it. This would require frequent coordination with homeowners and increase operational costs. The homes that receive the systems would need to have indoor space available. If no space is available, outdoor storage would need to be constructed to store the filters. The filters are not frost resistant, so the storage units need to be heated and the plumbing covered with frost resistant tape. Additionally, the list of homes that require POE systems in Pellston changes frequently due to fluctuating concentrations. Since POE systems require ongoing maintenance and sampling, a public water system would require less coordination with homeowners in the long-term and pose less risk of PFAS exposure.

Capital Equipment Required

The equipment required for the installation of a POE system in each household includes:

- Two or more granular activated carbon (GAC) filters installed in series.
- Sampling ports
- Ball valves
- Flow restrictor
- Flow meter
- Pressure gauges

- Pre-filter (some systems also include a post filter)
- Filter units

A schematic diagram illustrating an example of a POE system can be found in Appendix B. Additional materials may include pipe thread tape, pipe joint adhesive/solvents, piping, and valve parts. Shut off valves and by-pass piping will be installed to allow the system to be isolated and drained during repairs or maintenance. The sampling ports will be installed at the beginning of the system to sample the untreated well water, in between filters to monitor individual filter status, and after the filters to observe effluent concentrations. The locations of the sampling ports should take accessibility into account since they will be used regularly. Throughout the system, all materials should be PFAS-free and Teflon-free, which may require coordination with manufacturers. Bacterial disinfection is provided by an ultraviolet (UV) filtration unit downstream of the GAC cartridges.

Site Requirements

Plumbing and electrical licensed professionals should visit the residences that need a POE system to identify the best location for system installation. The factors considered when identifying this location include the size of the area, location in the home, layout of mechanical systems, electrical outlets, and accessibility for maintenance. The Aquasana OptimH2O POE system and the Culligan Portable Exchange Carbon Filter System were referenced to determine site requirements. If this alternative is decided to be explored further, it is assumed a more detailed review of POE options will be completed and the most appropriate one will be used for detailed design. The Aquasana OptimH2O is approximately 43” in width, 42” in height, and 8” in depth. The Culligan system is approximately 51” in width, 60” in height, and 12” in depth. The specific layout and dimensions of the Culligan system can be found in Appendix C. However, the use of additional filtration units would increase the area required for installation. The system requires a nearby ground fault interrupter (GFI) outlet, and this should be installed if the selected location does not already contain one. The diameter of the existing water pipes should be measured ahead of time to mitigate complications throughout the installation process. The selected location should be in a heated location, if this is not possible, measures should be taken to prevent freezing. The selected location for system installation should be reviewed and discussed with the homeowner.

Operation and Maintenance Requirements

According to the discussion with EGLE attached in Appendix A, samples should be collected after both the lead and lag filters. The compliance point is the sample taken after the lead filter, as the lag filter serves as a secondary insurance measure. If breakthrough were to occur in the lead filter, the lag filter would continue to treat the water until the lead filter can be changed out. Sampling after the lag filter allows the concentrations at the entry point to the distribution system to be measured. All work performed on the system, including sampling, is required to be performed by a licensed operator. In-home surveys should be completed along with sample collection to gather information on the filter’s status and other information required for public health investigations. The frequency of filter replacement will be dependent on the PFAS concentrations the filters are treating and replacement should be prompted by sampling results or the manufacturer’s recommendations. When a filter is replaced, samples should be taken prior to the replacement and after.

Existing PFAS Concentrations

The existing PFAS concentrations from the sampling in Pellston through August of 2022 can be observed in Figure 1. This figure categorizes the wells and parcels in Pellston based on PFAS concentrations in comparison to the EGLE MCLs and the EPA MCLs. The PFAS concentrations at each well in Pellston is in influx along with the number of wells that are in exceedance of the EGLE MCLs and the EPA MCLs due to ongoing plume delineation and evolving regulatory framework.

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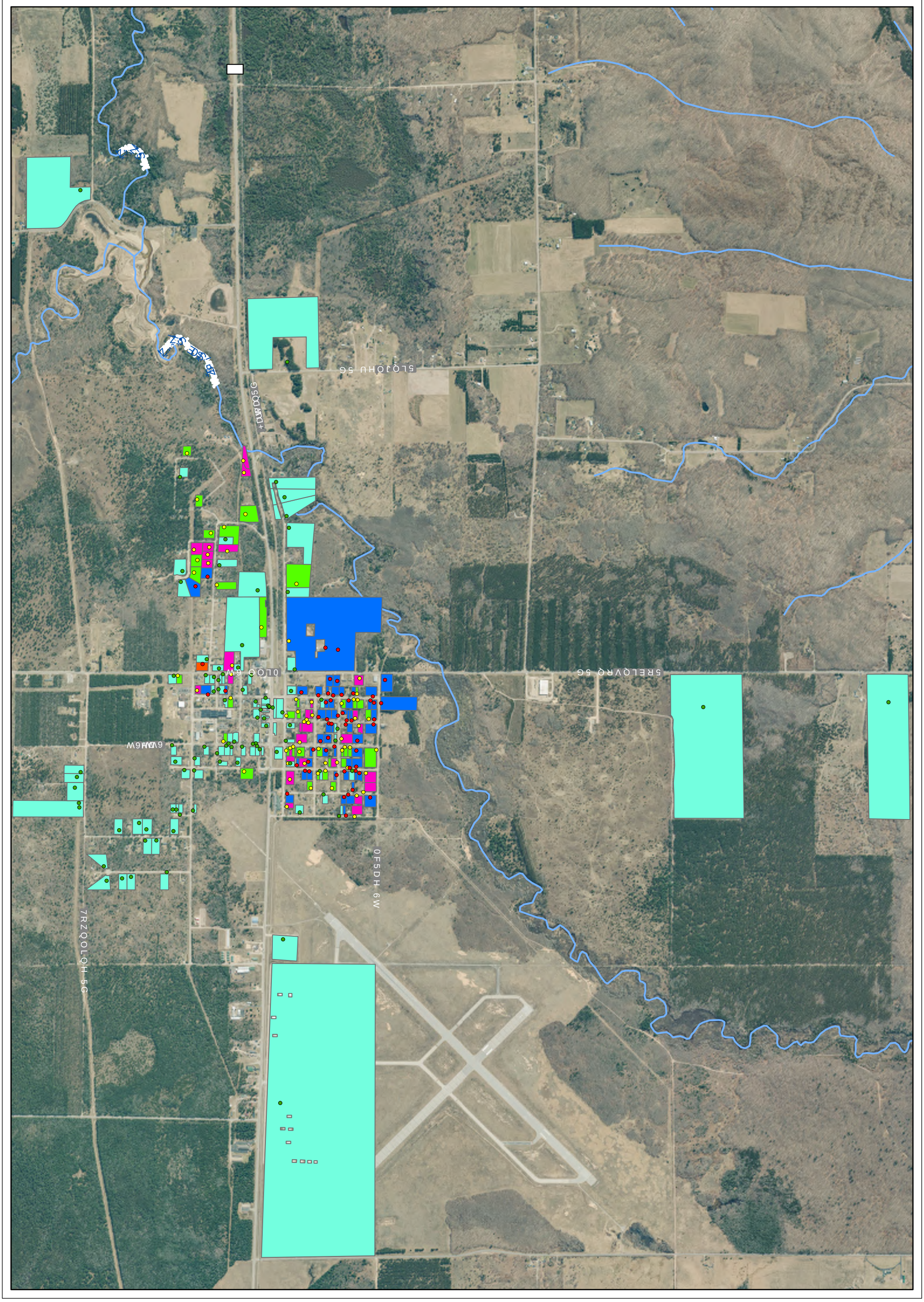

Cost Estimate

Initial Investment Cost and Ongoing Operation and Maintenance Cost

The estimated costs for the Village of Pellston are based on two sources. The first source contains the costs from a similar project involving PFAS contamination in Camp Grayling, Michigan. The quote provided by the Mannik Smith Group for the Camp Grayling filtration units is provided in Appendix D. This project is in the pilot stages and a more accurate estimate could be developed from this project with time. The costs from the Camp Grayling example were scaled to the situation in the Village of Pellston. Estimated costs were also provided by McCardel Culligan Water of Traverse City (Culligan). Culligan provided cost estimates at current rates and this location could potentially perform the installation and maintenance of the systems in Pellston. The costs provided by Culligan were estimated based on existing PFAS concentrations in Pellston and could change depending on fluctuating PFAS concentrations, water quality, and the number of homes requiring filtration systems. The anticipated annual costs for the installation and maintenance of POE systems in Pellston are purely an estimate.

Targeting EGLE MCLs

The estimated costs were generated based on several different approaches. First, the costs were estimated when installing systems in all homes with PFAS detections and treating those locations to acceptable concentrations when referencing EGLE MCLs. Then, the costs were estimated when installing systems in all homes with PFAS detections and treating those locations to acceptable concentrations when using the EPA MCLs. These estimates were generated using both Camp Grayling and Culligan costs for installation. Two different monitoring approaches were evaluated, which are described in more detail in the text below, and these approaches also referenced both Camp Grayling and Culligan costs. Table 3 describes the different alternatives that were explored for cost estimating purposes.

Table 3.Cost Estimate Alternatives

Cost Estimate Alternatives			
Target Regulations	**Installation - Costs**	**Monitoring - Approach**	**Monitoring - Costs**
EGLE MCLs	Camp Grayling, MI Costs	Quarterly Monitoring Approach (Camp Grayling, MI)	Camp Grayling, MI Costs
			Culligan Costs
	Culligan Costs	Concentration-Based Monitoring Approach (Plainfield/Algoma Townships, MI)	Camp Grayling, MI Costs
			Culligan Costs
EPA MCLs	Camp Grayling, MI Costs	Quarterly Monitoring Approach (Camp Grayling, MI)	Camp Grayling, MI Costs
			Culligan Costs
	Culligan Costs	Concentration-Based Monitoring Approach (Plainfield/Algoma Townships, MI)	Camp Grayling, MI Costs
			Culligan Costs

When using the EGLE MCLs as the threshold, each POE system would only require two filter units. This includes a lead filter to treat the water to an acceptable concentration and a lag filter as a secondary insurance measure. Although PFAS was detected in 124 wells, three of the wells are located at Pellston Pioneer Park and it was assumed that this location would only require one system. The estimated costs were based on 122

locations requiring a POE system when using EGLE criteria, with the understanding that the number of homes requiring filtration will fluctuate due to plume migration and changes to MCL requirements.

Installation costs were estimated using the two different sources mentioned, Camp Grayling and Culligan. Additional costs could be required to build a structure to house the system if an area is not currently available. During the conversation with EGLE members in Appendix A, it was mentioned that installation in Camp Grayling was estimated to cost up to $10,000-$15,000 per unit due to the construction of external heated enclosures. The middle of this range was used as a conservative estimate for installation costs from Camp Grayling. This represents the higher end of installation costs if more structures needed to be built for comparison purposes. The costs listed in the quote for Camp Grayling in Appendix D were referenced for the other Camp Grayling estimated costs. This cost ($4,786) just represents the cost of the filtration unit, plumber and electrician fees, and management and oversight fees for installation. The total installation costs do not include installing systems at locations where concentrations are not being detected currently. The installation costs per unit as well as the total installation costs for Pellston can be compared in Table 4. When referencing the more conservative costs from Camp Grayling, installation would cost $1,525,000 total for 122 units. However, when using the costs listed in the contract from Camp Grayling, the total installation cost would be $583,925. When referencing the costs given by Culligan, the total cost would be $1,012,600. The costs provided for the project in Camp Grayling included an additional lump sum cost of $3,790 for a health and safety plan for the project, this was not included in the installation costs.

Table 4. Installation Costs

Installation Costs				
Source	**Item**	**Cost per Location**	**Locations**	**Total Cost**
Camp Grayling, MI (Conservative)	Installation (2 filters)	$12,500	122	$1,525,000
Camp Grayling, MI	Installation (2 filters)	$4,786	122	$583,925
Culligan	Installation (2 filters)	$8,300	122	$1,012,600

Operations and Maintenance costs were estimated using the two sources mentioned as well as two different approaches. POE systems can be monitored in several different ways, some being more cost effective than others. For estimating purposes, two monitoring approaches were referenced. The first approach uses the method described for the project in Camp Grayling in Appendix D, which was a quarterly monitoring approach. This method requires quarterly sampling and assumes 75% of the systems installed will need a filter replacement per year. The filters used in both systems referenced are expected to treat 100,000 gallons at a flow rate of 8 gallons per minute (GPM) before achieving breakthrough. However, filter replacement costs may vary depending on water quality and could be adjusted as the systems are monitored. The costs were estimated using the quarterly monitoring approach as well as the Camp Grayling and Culligan costs in Table 5 and Table 6. When referencing Camp Grayling costs, operations and maintenance would cost approximately $850,932 per year for all locations. When using Culligan costs, operations and maintenance would cost $977,953 per year for all locations. It should be noted that some maintenance items were assumed for a percentage of systems and the costs were evenly distributed across all locations to provide an average cost per location. However, some operations and maintenance items were included in the Camp Grayling costs that were not addressed in the Culligan costs (homeowner requested maintenance, issues, etc.). The Culligan cost estimate could increase with the addition of these items and the specific list of items included can be seen in the tables below.

Table 5. Quarterly Monitoring Approach using Camp Grayling, MI Costs

Quarterly Monitoring Approach (Camp Grayling, MI Costs)					
Item	**Unit Cost**	**Yearly Occurrences**	**Cost per Location per Year**	**Total Locations**	**Total Cost per Year**
Sampling	$776	4	$3,102	122	$378,493
Home Owner or MDMVA requested O&M or Issue	$1,684	Assumed 1 for 30% of locations	$505	122	$61,648
Home Owner Scheduled Appointment – Owner No Show	$200		$60	122	$7,320
Pre & Post Filter Replacement Home Water Sampling	$3,151	Assumed 1 for 75% of locations	$2,363	122	$288,277
Home Water Filter Replacement	$1,259		$944	122	$115,194
		Total per Location	$6,974	**Total All Locations**	$850,932

Table 6. Quarterly Monitoring Approach using Culligan Costs

Quarterly Monitoring Approach (Culligan Costs)					
Item	**Unit Cost**	**Yearly Occurrences**	**Cost per Location per Year**	**Total Locations**	**Total Cost per Year**
Sampling	$1,215	4	$4,860	122	$592,905
Pre & Post Filter Replacement Home Water Sampling	$2,355	Assumed 1 for 75% of locations	$1,766	122	$215,476
Home Water Filter Replacement	$1,853		$1,390	122	$169,571
		Total per Location	$8,016	**Total All Locations**	$977,953

The second monitoring approach uses a concentration-based approach and references another project in Michigan where PFAS contamination is being addressed. This project is in Plainfield and Algoma Townships, Michigan and the project plan prepared by Rose and Westra on behalf of Wolverine World Wide, Inc. can be found in Appendix E. The performance monitoring sampling schedule for this project groups the existing concentrations into categories and assigns a sampling schedule to each category. This project also assigns filter change out frequencies and the percentage of systems sampled after change outs based on influent concentrations. This approach reduces costs as more resources are allocated towards locations with higher concentrations than the lower concentration locations. The project in Plainfield and Algoma Townships included sampling schedules for PFAS concentrations much higher than what is currently in Pellston. However, the schedules used for the systems in Pellston may need to be adjusted as the systems are monitored. The project grouped the locations based on the sum of PFOA and PFOS concentrations. In Pellston, other regulated PFAS compounds are present. These other compounds were taken into consideration and some locations were moved to a more frequent schedule based on existing concentrations in relation to the specific compound's MCL. Of the 122 locations in Pellston that would require a POE system, 97 of those locations would fall into the first category where sampling would be performed semi-annually. The remaining 25 locations fall into the second category where sampling would be performed quarterly. The costs were estimated using the concentration-based monitoring approach as well as the Camp Grayling and

Culligan costs in Table 7 and Table 8. As shown, when using the Camp Grayling costs and this monitoring approach, operations and maintenance would cost $381,597 per year for all locations. The Culligan costs would produce a total operations and maintenance cost of $570,630 per year for all locations. Both estimated yearly costs are significantly less than the yearly costs estimated using the quarterly monitoring approach.

Table 7. Concentration-Based Monitoring Approach using Camp Grayling, MI Costs

Concentration-Based Monitoring Approach (Camp Grayling, MI Costs)						
Concentration (PFOS+PFOA)	**Locations**	**Sampling Events per Year**	**Total Sample Cost per Location per Year**	**Total Change Out Cost per Location per Year**	**Total Cost per Location per Year**	**Total Pellston Cost per Year**
1 - 70 ppt	97	2	$1,695	$1,062	$2,757	$267,472
71 - 1000 ppt	25	4	$3,384	$1,181	$4,565	$114,125
					Total	$381,597

Table 8. Concentration-Based Monitoring Approach using Culligan Costs

Concentration-Based Monitoring Approach (Culligan Costs)						
Concentration (PFOS+PFOA)	**Locations**	**Sampling Events per Year**	**Total Sample Cost per Location per Year**	**Total Change Out Cost per Location per Year**	**Total Cost per Location per Year**	**Total Pellston Cost per Year**
1 - 70 ppt	97	2	$2,641	$1,478	$4,120	$399,605
71 - 1000 ppt	25	4	$5,274	$1,567	$6,841	$171,025
					Total	$570,630

Targeting EPA MCLs

Estimated costs were also generated when installing systems in all homes with PFAS detections and treating these locations to acceptable concentrations according to the EPA MCLs. When using the EPA MCLs as the threshold, six POE systems would require three filter units, while the remaining 116 systems would only require two filter units. The six systems with three filter units would require two lead filters to treat the water to an acceptable concentration followed by a lag filter. This is based on the reduction rate given for the system in Grayling and the same rate was assumed for the Culligan system for comparison purposes. The specific reduction rate for the Culligan system is dependent on water quality and could be further investigated with a field study in Pellston. The number of homes in Pellston that would require a POE system and more specifically a system with three filter units may fluctuate due to plume migration and the reduction rate of the Culligan system if selected for implementation. Additionally, more filter units could be added to systems if higher flow rates are desired. Installation costs were estimated using costs from Camp Grayling and Culligan. These costs were estimated to comply with the EPA MCLs using the same approach and assumptions as the installation costs mentioned above for compliance with EGLE MCLs. The installation costs can be compared in Table 9. Two different ranges of costs are included from Camp Grayling. The first cost is more conservative and illustrates the estimated costs for the combination of the two and three filter systems, this would cost $1,536,448 total for all locations. When using the estimated costs from the Camp Grayling contract, installation for the combination of the two and three filter systems would cost $595,373 and $1,024,600 when referencing the costs given by Culligan.

Table 9. Installation Costs

Installation Costs					
Source	**Item**	**Cost per Location**	**Locations**	**Cost**	**Total Cost**
Camp Grayling, MI (Conservative)	Installation (2 filters)	$12,500	116	$1,450,000	$1,536,448
	Installation (3 filters)	$14,408	6	$86,448	
Camp Grayling, MI	Installation (2 filters)	$4,786	116	$555,207	$595,373
	Installation (3 filters)	$6,694	6	$40,166	
Culligan	Installation (2 filters)	$8,300	116	$962,800	$1,024,600
	Installation (3 filters)	$10,300	6	$61,800	

Operations and Maintenance costs were estimated for compliance with the EPA MCLs using the Camp Grayling and Culligan costs as well as the two different monitoring approaches described above. The first approach uses the quarterly monitoring approach described for the project in Camp Grayling in Appendix D and costs were estimated using the two cost sources in Table 10 and Table 11. The quarterly monitoring approach combined with the costs from the Camp Grayling project would produce a total cost per year of $856,597. Similarly, when referencing Culligan costs, this monitoring approach would cost $985,153 per year for all locations. The specific list of items included can be seen in the table below and Culligan costs could increase with the addition of the items included in the Camp Grayling costs.

Table 10. Quarterly Monitoring Approach using Camp Grayling, MI Costs

Quarterly Monitoring Approach (Camp Grayling, MI Costs)					
Item	**Unit Cost**	**Yearly Occurrences**	**Cost per Location per Year**	**Total Locations**	**Total Cost per Year**
Sampling	$776	4	$3,102	122	$378,493
Home Owner or MDMVA requested O&M or Issue	$1,684	Assumed 1 for 30% of locations	$505	122	$61,648
Home Owner Scheduled Appointment – Owner No Show	$200		$60	122	$7,320
Pre & Post Filter Replacement Home Water Sampling	$3,151	Assumed 1 for 75% of locations	$2,363	122	$288,277
Home Water Filter Replacement	$1,259		$944	116	$109,529
	$2,518		$1,888	6	$11,331
Total per Location (2 filters)			$6,975	**Total All Locations**	$856,597
Total per Location (3 filters)			$7,919		

Table 11. Quarterly Monitoring Approach using Culligan Costs

Quarterly Monitoring Approach (Culligan Costs)					
Item	**Unit Cost**	**Yearly Occurrences**	**Cost per Location per Year**	**Total Locations**	**Total Cost per Year**
Sampling	$1,215	4	$4,860	122	$592,905
Pre & Post Filter Replacement Home Water Sampling	$2,355	Assumed 1 for 75% of locations	$1,766	122	$215,476
Home Water Filter Replacement	$1,853		$1,390	116	$161,232
	$3,453		$2,590	6	$15,540
Total per Location (2 filters)			$8,016	**Total All Locations**	$985,153
Total per Location (3 filters)			$9,216		

The second monitoring approach uses a concentration-based approach referenced from the project in Plainfield and Algoma Townships which is described in Appendix E. This approach was used to estimate the costs required to achieve acceptable concentrations according to the EPA MCLs. In the higher concentration category, the systems that would require three filters (six locations) are separated due to an increase in costs for filter change outs. The costs were estimated using this monitoring approach in Table 12 and Table 13. As shown, when using the concentration-based monitoring approach and the Camp Grayling costs, operations and maintenance were estimated to cost $387,262 per year for all locations. The Culligan costs would produce a total operations and maintenance cost of $577,830 per year for all locations. In comparison to the quarterly monitoring approach, these estimated yearly operations and maintenance costs are significantly less.

Table 12. Concentration-Based Monitoring Approach using Camp Grayling, MI Costs

Concentration-Based Monitoring Approach (Camp Grayling, MI Costs)						
Concentration (PFOS+PFOA)	**Locations**	**Sampling Events per Year**	**Total Sample Cost per Location per Year**	**Total Change Out Cost per Location per Year**	**Total Cost per Location per Year**	**Total Pellston Cost per Year**
1 - 70 ppt	97	2	$1,695	$1,062	$2,757	$267,472
71 - 1000 ppt	19	4	$3,384	$1,181	$4,565	$86,735
	6			$2,125	$5,509	$33,055
					Total	$387,262

Table 13. Concentration-Based Monitoring Approach using Culligan Costs

Concentration-Based Monitoring Approach (Culligan Costs)						
Concentration (PFOS+PFOA)	**Locations**	**Sampling Events per Year**	**Total Sample Cost per Location per Year**	**Total Change Out Cost per Location per Year**	**Total Cost per Location per Year**	**Total Pellston Cost per Year**
1 - 70 ppt	97	2	$2,641	$1,478	$4,120	$399,605
71 - 1000 ppt	19	4	$5,274	$1,567	$6,841	$129,979
	6			$2,767	$8,041	$48,246
					Total	$577,830

The costs referenced from the project in Camp Grayling are based on the use of the Aquasana OptimH2O filter system which was used for the project in Camp Grayling. The costs from Culligan are based on the use of the Culligan Portable Exchange Carbon Filter System. The exact type of POE system including the specific equipment and parts used could be reviewed and identified once POE systems are selected for implementation and the project has developed further.

Assumptions

There were assumptions made when developing the costs for POE systems in Pellston. Costs were estimated with the assumption that a POE system will be installed at each location where PFAS concentrations have been detected, they do not include the installation and operation and maintenance of systems at locations where PFAS has not been detected. Some locations sampled were outside of the village limits but the costs to provide POE systems to these locations were included. Three samples were taken from Pellston Pioneer Park due to the presence of multiple wells, however, it was assumed that only one filtration system will be required for this location. New locations could appear over time that would require the installation of a POE system. The following assumptions are arranged by the source they derived from and which portion of the estimated costs they impact.

Assumptions from Camp Grayling, MI

Since the cost estimate for the project in Grayling was referenced, the assumptions made in Grayling apply to these cost estimates as well which can be found in Appendix D. There were two different Camp Grayling installation costs mentioned. The first, more conservative cost derives from implementation in Camp Grayling where storage sheds needed to be constructed to house the filtration units. The other Camp Grayling installation costs were assumed from the contract in Camp Grayling where installation costs were estimated for the project and are more representative of the installation of the filtration unit itself rather than addressing the availability of a suitable area to house the system. These values were then adjusted for the number of filters used for treatment. The Aquasana OptimH2O filter system has a life expectancy of one year for a family of four. More specifically, the filter can treat 100,000 gallons at a flow rate of 8 gallons per minute (GPM). The Aquasana OptimH2O system does not sell the filter housing unit separately and it was assumed that an Aquasana system would have to be purchased for each filter required. As a part of this approach, two sets of influent and effluent samples would be collected for filter replacements, a set before and after replacement. Samples should be collected after both the lead and lag filters and the compliance point is after the lead filter, according to the discussion with EGLE in Appendix A. The Michigan PFAS Action Response Team, which was referenced in the project in Camp Grayling, states that any supply that has a detection for any regulated PFAS compounds should be sampled quarterly. This was referenced for the quarterly monitoring approach. The Camp Grayling project required an additional duplicate sample be collected every tenth sample and this was assumed as a part of this approach.

Assumptions from Plainfield and Algoma Townships, MI

There were assumptions made for the cost estimates based on the Plainfield and Algoma Townships project. As a part of the concentration-based monitoring approach samples were grouped into categories by concentration to determine a sampling and filter change out schedule. The cost estimates using this approach are based on current concentrations of regulated PFAS compounds and the assumption that the locations in Pellston will be placed into the categories mentioned. Additional compounds may be present but were not considered when adjusting the categories. The Plainfield and Algoma Townships project required four additional QC samples be collected every 20 samples and this assumption was made for sampling under this approach. It was assumed that two sets of influent and effluent samples would be required as a part of the filter replacement sampling, a set before replacement and after. However, for the pre and post filter replacement sampling costs, it was assumed one blank sample would be required every tenth sample. This assumption was made as a result of how the Camp Grayling costs were given in the document and to allow the Camp Grayling costs to be applied to the concentration-based monitoring approach. The assumptions made for the Plainfield and Algoma Townships project are described in more detail in Appendix E.

Assumptions from Culligan

The costs estimated from Culligan had several assumptions associated with them as well, the system referenced is shown in Appendix C. It was assumed that this system would be installed and maintained by Culligan. Culligan had estimated that an extra filter unit would cost an additional $2,000 for installation and this estimated rate was assumed for the costs of the three filter system. When estimating the quantity of three filter systems needed, it was assumed that the Culligan system would reduce PFAS concentrations at the same rate as the Aquasana system, which was a 97.9% reduction rate. The Culligan system has a life expectancy of 100,000 gallons at a flow rate of 8 gallons per minute (GPM). The Culligan system has operated for a minimum of one year without breakthrough at concentrations higher than the current concentrations in Pellston. In some applications, the Culligan system has treated 140,000 to 160,000 gallons before requiring a filter change out. The life expectancy of the Culligan system is dependent on water quality as some organic compounds can impact the performance of the filters and cause pressure drops, change out schedules could be adjusted as needed through implementation. It was assumed that the pre and post filter replacements would be performed by a Culligan representative. The operations and maintenance costs from Culligan include the assumption that samples will be shipped to the laboratory for testing as a complete set of samples (six samples). If samples were to be shipped in quantities less than six, shipping costs would increase per sample. The shipping costs used were current as of November 2023, however, rates are dependent on the shipping company used and could change in the future.

Single Household Costs

The total cost of the installation of POE systems in every home in Pellston that has detected PFAS concentrations can be broken down into individual costs per household. There are capital costs for the initial installation of the systems in each home and the ongoing operations and maintenance costs that would be required for each year the system operates. The estimated costs are dependent on the costs referenced and could vary depending on the monitoring approach selected for implementation. These costs are described in the tables above for each investigated approach but are listed as single household costs in Table 14 based on EGLE MCLs. The total year one costs include installation and the first year of operations and maintenance costs and the ongoing yearly costs include only operations and maintenance costs. Operations and maintenance costs were estimated using the average between the two costs sources for the approach listed. As shown in the table, single household total year one costs were estimated to be between $8,689 and $19,996. These are approximations based on the project in Camp Grayling, the project in Plainfield and Algoma Townships, and the estimated costs given by Culligan.

Table 14. Annual Operation and Maintenance Estimated Costs

Single Household Costs			
Installation	**Monitoring Approach**	**Average Total Year 1 Cost**	**Average Ongoing Yearly Costs**
Camp Grayling, MI Costs (Conservative)	Quarterly Monitoring Approach	$19,996	$7,496
	Concentration-Based Monitoring Approach	$16,403	$3,903
Camp Grayling, MI Costs	Quarterly Monitoring Approach	$12,282	$7,496
	Concentration-Based Monitoring Approach	$8,689	$3,903
Culligan Costs	Quarterly Monitoring Approach	$15,796	$7,496
	Concentration-Based Monitoring Approach	$12,203	$3,903

Disposal Costs

The POE systems will produce filters to be disposed of once PFAS breakthrough is observed. The acceptable disposal option at this time is landfilling. The disposal costs and specific processes for the spent filters from the POE systems in Pellston is unknown and therefore not included in this cost estimate. It is not clear who will be handling this portion of the system's operation, which will require an ongoing conversation and eventual agreement between the involved parties.

Summary

Point of Entry systems can be useful to provide treated water to the residents of Pellston, especially in the short-term. These systems can be installed at each residence and provide clean water to all the taps throughout their home. After exploring the different alternatives used in the projects that were referenced, the total project costs could vary depending on factors such as the number of structure modifications needed to house the systems, the specific system used, and the operational, maintenance, and monitoring approach used. Overall, when using the conservative installation costs from Camp Grayling ($10,000-$15,000) the costs are estimated to be the highest. The Culligan costs offer a midpoint estimate, and the costs from the Camp Grayling contract provide the lowest estimate. As mentioned, the discrepancy between the higher and lower Camp Grayling costs could be attributed to the number of instances where structure modifications are required for system installation. Operations and maintenance costs are lowest when using the concentration-based monitoring approach, as opposed to the quarterly monitoring approach. This can be attributed to minimizing operations and maintenance costs. The target concentrations also have an impact on the total costs of the project. When using the EGLE MCLs as the target, the project would cost less than using the EPA MCLs. Costs were estimated to install POE systems at the locations in Pellston that currently have detectable concentrations of PFAS. The number of homes with PFAS concentrations is subject to change. Additionally, costs could be reduced if systems were only installed at locations with exceedances. If the EGLE MCLs were the target, installation as well as the first year of operations and maintenance could range from $965,522 to $2,502,953 total. These estimates were based on a combination of the Camp Grayling and Culligan costs as well as the two monitoring approaches to show the span of the estimated year one costs. The ongoing yearly

operations and maintenance costs could range from $381,597 total when referencing the Camp Grayling costs and the concentration-based monitoring approach to $977,953 total when referencing the Culligan costs and the quarterly monitoring approach. Project costs would increase if the EPA MCLs were the target. The costs will be fine-tuned as the project develops and more accurate costs become available. POE systems can serve as a temporary solution so affected residents have a higher level of service until a long-term solution is implemented for the Village of Pellston.

References

EGLE. (2023, April 28). *What is a Public Water Supply?* Retrieved from https://www.michigan.gov/egle/about/organization/drinking-water-and-environmental-health/drinking-water/what-is-a-public-water-supply

Appendix A: EGLE Meeting Discussion Summary Memo
Appendix B: POE Treatment System Guide
Appendix C: Culligan PFAS System
Appendix D: Mannik Smith Group Quote for Camp Grayling Filtration Units
Appendix E: Alternative Water Supply Management Plan Point-of-Entry Treatment Systems

Appendix A: EGLE Meeting Discussion Summary Memo

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memorandum

Date: March 29, 2023

To: James Gillett, Village President and Lisa Fought, Village Clerk: Village of Pellston
From: Karlin Danielsen, Steve Warren, Susan Knepper, Skyler Kruger: OHM Advisors

Re: EGLE Opinion on Point of Entry Systems for PFAS Removal in the Village of Pellston

The Village of Pellston requested that OHM Advisors explore Point of Entry (POE) systems for the removal of per- and polyfluoroalkyl substances (PFAS) as an option for providing safe drinking water to their impacted residents. The impacted residents are presently using Point of Use (POU) systems that provide treated water at one location in the home, usually the kitchen sink. POE systems treat whole house water and can provide higher flow rates than the POU systems presently in place. The focus of the evaluation included regulatory approval, cost, and maintenance and disposal requirements. The project team reached out to Department of Environment, Great Lakes and Energy (EGLE) representatives on 3/6/2023 to clarify starting assumptions to prepare the evaluation. This document summarizes the starting assumptions, and EGLE representatives responses to those assumptions. The EGLE staff present during the conversation included: Sara Pearson, Christiaan Bon, Lisa Kruse, and Randy Rothe. Sara Pearson oversees the long-term contaminant monitoring and the private well construction programs for the Drinking Water and Environmental Health Division.

Review of Assumptions

Assumption: POE systems are accepted by EGLE and the Health Department as a long-term solution for PFAS removal in private homes.
EGLE Response

- EGLE does not accept POE systems for drinking water because long term use is complicated. People will often remove filters and might not give access for the systems to be checked and maintained. However, they would be accepted as an interim measure if checked and maintained by a qualified professional. For example, it might take years before a public water supply system is in place in Pellston. The POE systems could be considered for long term use if they were the only option in a specific case.
- There are approximately 60 homes in Pellston with concentrations that exceed the Michigan MCLs, many of them are near the airport. There were 3 new homes identified today that exceed the Michigan MCLs. New homes are constantly popping up as exceeding the MCLS because you cannot easily delineate who is using the contaminated aquifer and the plume delineation is ongoing.
- PFAS regulations from the EPA could change the treatment target. It is recommended to follow the current EGLE MCLs. If the EPA issues MCLs that are lower, the EPA MCLs will be the new target.

Assumption: Point of Entry is the compliance point.
EGLE Response:

- Point of entry is the compliance point, and testing should be done after the filter.

Assumption: No testing is required at the point of use.
EGLE Response:

- This assumption is confirmed.

Assumption: No flushing of in-house plumbing is required.
EGLE Response:

- This assumption is confirmed.

Assumption: Analysis will be completed by EPA method 537.1 as long at the Michigan MCLs are the compliance target. The analytical method may be updated by future EPA requirements.
EGLE Response:

- It is recommended to follow the most current testing methods.
- Drinking water analysis will be conducted by EPA method 537.1 using the Michigan PFAS Minimum Laboratory Analyte List. **https://www.michigan.gov/pfasresponse/investigations/sampling-guidance/analyte-list**
- The public prefers concentrations to be at non-detect for all PFAS compounds. There is no regulatory driver behind this, but it is an expectation from the public.
- On 3/15/23, the EPA issued proposed MCLs for certain PFAS compounds.
    - The proposal, if finalized, would regulate PFOA and PFOS as individual contaminants, and will regulate four other PFAS – PFNA, PFHxS, PFBS, and GenX Chemicals – as a mixture.
    - PFOA and PFOS: EPA is proposing to regulate PFOA and PFOS at a level they can be reliably measured at 4 parts per trillion.
    - PFNA, PFHxS, PFBS, and GenX Chemicals: EPA is also proposing a regulation to limit any mixture containing one or more of PFNA, PFHxS, PFBS, and/or GenX Chemicals. For these PFAS, water systems would use an established approach called a hazard index calculation, defined in the proposed rule, to determine if the combined levels of these PFAS pose a potential risk.
- **https://www.epa.gov/newsreleases/biden-harris-administration-proposes-first-ever-national-standard-protect-communities**

Assumption: Blanks will need to be collected at each home during maintenance checks.
EGLE Response:

- This assumption is not correct.
- EGLE recommends one duplicate per twenty samples, a trip blank and a field blank.

Granular Activated Carbon (GAC) filtration systems usually contain two filters in series. The first filter is called the “Lead Filter” and the second the “Lag Filter.”
Assumption: Samples are needed between the Lead and Lag, after Lag, or at the POU?
EGLE Response:

- Samples are collected after both the Lead and the Lag filters. The compliance point is after the Lead filter.
- If there is breakthrough, dispose of the Lead filter, move the Lag filter into the Lead position, and install a new Lag filter.

Assumption: The homes receiving filtration systems are those with any PFAS concentrations above the MCL?
EGLE Response:

- When any concentration of PFOS/PFOA is present, it could easily spike in future sampling events.
- The target concentration should be below the MCL at the least. If you’re sampling and you get any detection, it is recommended to change the filter. Once breakthrough occurs for PFOS/PFOA, the remaining compounds follow closely behind. The goal becomes non-detect for compounds with lower MCLs.

- There is also a delay in the time it takes to get results back from the lab, indicating concentrations could change within that time frame.
- This process results in two separate visits to the POE system, one for the sampling and one for the filter replacement.
- Even if a filter is still providing samples that are considered non-detect past the filter's life, it is recommended to change them out at the recommended time interval. Break through usually occurs much sooner than advertised by the manufacturer.
- In Grayling, the lifespan is dependent on the load of PFAS coming in. They could require multiple cannisters due to breakthrough.
- **Note from Sara Pearson 3/9/2023:** I would caution on the design of adding more filters to reduce changeouts versus more frequent changeouts of the carbon. I would consult with an engineer on this, and I provide this as just a caution on the assumption.

Assumption: Ion exchange and microfiltration require backwash of the filters and would return removed PFAS to the septic systems and groundwater. GAC type filtration devices will be required because they remove PFAS compounds from circulation.
EGLE Response:

- This is an appropriate assumption.

Additional Questions and Discussion

Question: What is the GAC filter disposal requirement?
EGLE Response:

- The disposal process is land filling.

Question: How are the POE systems funded?
EGLE Response:

- Installation, maintenance, sampling, and disposal of POE systems is to be provided by the liable party (in this case, Emmett County). Sampling is performed by a contractor hired by the liable party. In Grayling, a licensed plumber installed the systems.
- Emmett County might be a good contributor to future discussions.
- When exploring POE systems, it is important to consider their lifecycles. For example, they might need to be overhauled or replaced before a water system is in place. We need to define the expected life of the filters (5 years, 8 years, etc.) and consider the replacement costs.

Question: What were the POE costs for Camp Grayling?
EGLE Response:

- Units were $10,000-$15,000 per home to install. Some homes did not have space inside the home for the filters, so external heated enclosures needed to be built and connected to the home plumbing. They use UV light for bacteria sterilization, which has not needed to be changed out. All maintenance has been on the GAC, not the UV disinfection. This has included multiple visits to each home per year for sampling and changing out filters.
- EGLE is asking the Grayling team for a "ballpark number" for reference.
- **Update from Christiaan Bon 3/9/2023:** Costs were provided after the meeting and may need adjustment from totals given during the meeting. The Department of Technology, Management and Budget contract was shared on 3/7 and is included as Attachment A. The contract states that costs may be slightly inflated to cover contingency. The cost to provide systems for 20 homes is $170,005.34 or approximately $8,500 per home.

Question: How are homeowners compelled to connect to the public water system?

EGLE Response:

- Ordinances are often used. These can require community members to hook up to the water distribution network.
- In the past, the Health Department has made connection to the public water system a requirement.

Appendix B: POE Treatment System Guide

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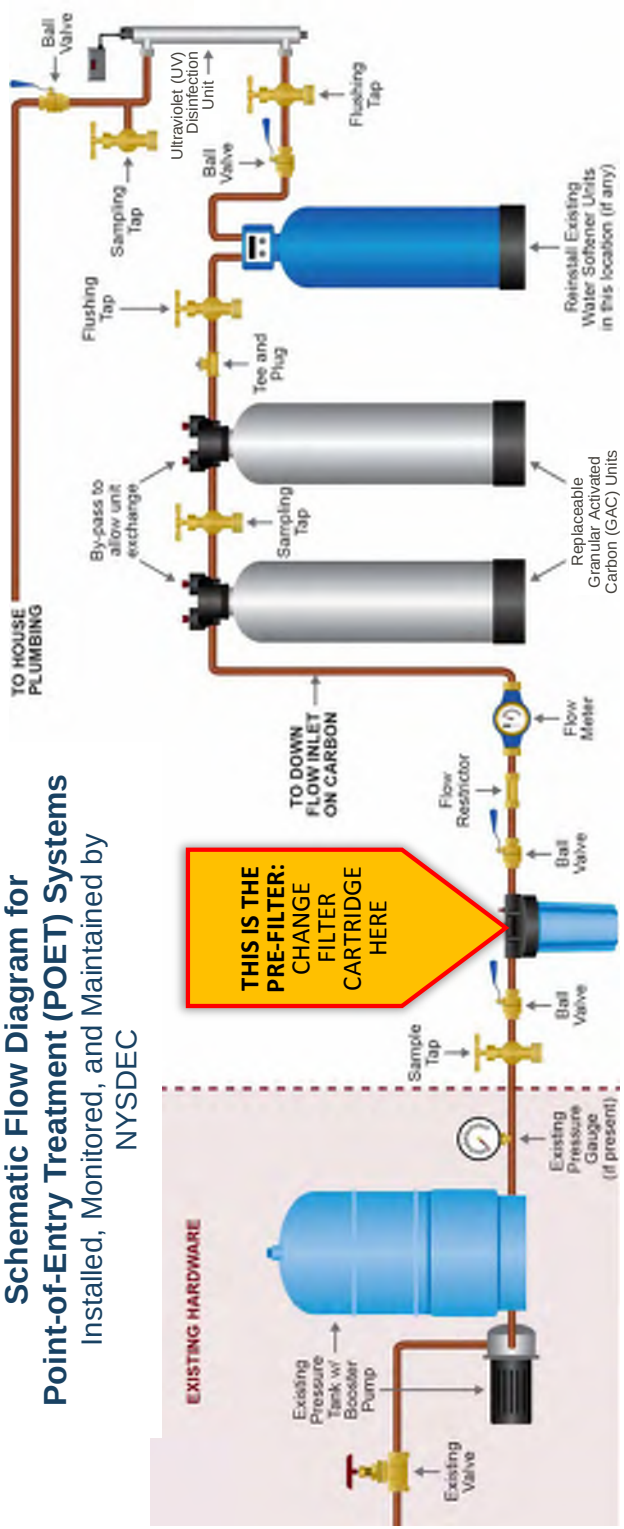


Schematic Flow Diagram for Point-of-Entry Treatment (POET) Systems
Installed, Monitored, and Maintained by NYSDEC

System Maintenance is Important

Monthly pre-filter replacement is recommended as an important part of keeping the system operating properly and maintaining good water pressure. The pre-filter removes sand, sediment, and other natural small particles that may come in from the well. Maintaining a clean pre-filter also reduces the need for in-home service by DEC representatives.

While DEC is responsible for overall maintenance of the system, it is suggested that pre-filter replacement be performed by the occupant.

DEC will provide a free annual supply of pre-filters and show you how and when to complete the replacement.

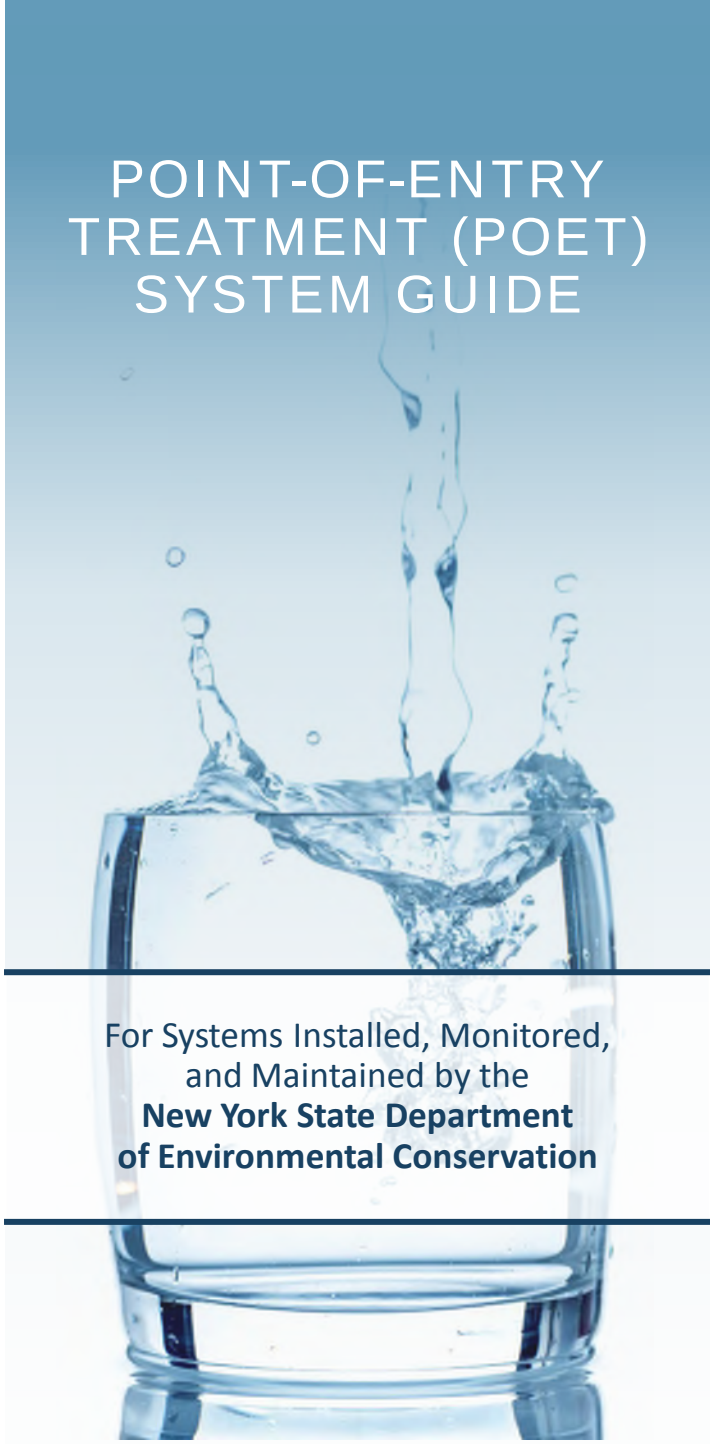
Generic instructions on how to change the pre-filter are provided in DEC's "How To Change the Pre-Filter" supplement to this guide. For more specific guidance or questions, call the DEC Hotline at 1-888-459-8667.

Maintenance activities DEC must perform include routine sampling, periodic replacement of the GAC tanks, cleaning or replacing the UV light quartz sleeve as needed, system inspection and checking for leaks, and checking proper valve settings and pressure.

WHEN TO CALL THE DEC HOTLINE 1-888-459-8667 (24/7)

- Before being away for more than 2 weeks
- To arrange for repair—do not attempt any system or plumbing repairs yourself
- When you need more pre-filters
- If you have any questions

POINT-OF-ENTRY TREATMENT (POET) SYSTEM GUIDE



For Systems Installed, Monitored, and Maintained by the
New York State Department of Environmental Conservation

NEW YORK STATE OF OPPORTUNITY. Department of Environmental Conservation

This guide describes the main components and benefits of the Point-Of-Entry Treatment (POET) System installed in your home or building by the New York State Department of Environmental Conservation (DEC).

The purpose of the water treatment is to remove certain contaminants that may be in the drinking water entering area homes and buildings. The water treatment systems installed are specifically designed to address Perfluorinated compounds (PFCs), including perfluorooctanoic acid (PFOA) and perfluorooctane sulfonate (PFOS).

How the System Works

POETs are installed to filter and treat all water as it enters your home or building. As shown on the system flow diagram (back page), POETs filter and treat water using a small pre-filter followed by two tanks of granular activated carbon (GAC). In certain cases, smaller point-of-use treatment systems (POUTs) attach to faucets and fixtures where your water is dispensed.

POETs are designed to filter and disinfect groundwater (well water) for use in residential or commercial properties. Via your well pump, groundwater is piped into an existing pressure tank and then through an installed pre-filter (sediment trap) to remove sand and other natural small particles that may come in with the water.

As shown on the flow diagram, the water continues through the pre-filter and a flow restrictor, and then through a flow meter to measure how much water is flowing through the system. From there, the water continues into the first of two tanks filled with GAC to begin cleaning the water. The second GAC tank acts as a backup to provide redundancy to the filtering process. Next, the water may flow into a water softener if a softener was already in place before the POET or POUT system was added.

Finally, the water passes through an ultraviolet (UV) unit where the water is disinfected before it flows directly into the existing plumbing for use within the residence or commercial building.

Benefits of Water Treatment

POET and POUT systems control a wide variety of contaminants in drinking water and often use the same technology found in large centralized treatment plants, but at a much smaller scale.

This established technology reduces the amount of organic contaminants, controls turbidity (cloudiness of the water), and removes micro-organisms and many other contaminants. Aesthetic factors such as taste, odor, or color can also be improved with treatment.

QUESTIONS?
PLEASE CALL THE DEC HOTLINE
(available 24/7) at 1-888-459-8667

Water Quality Testing

DEC representatives will collect water from the "sampling taps" installed in the system at a minimum of once per year. Systems with higher incoming concentrations will initially be sampled more frequently. This routine sampling effort will provide data for the DEC to determine the lifespan of the carbon in the GAC tanks. The sampling and maintenance frequency is based on your specific well water and treatment system, and depends not only on sample results, but also how long the system components are performing as intended.

Additional follow-up visits to replace GAC tanks may be scheduled when necessary. Please note that the periodic sampling and maintenance schedule may change in the future based upon your sampling results, so that the system continues to successfully remove PFOA and PFOS from your drinking water.

Granular Activated Carbon Replacement

When water testing results indicate that a GAC tank needs to be changed, DEC representatives will promptly schedule a visit to perform the change out. This process typically involves installing a fresh GAC tank to replace the second tank in the system, and moving up the second tank to be first in line on the system. You do not need to flush the line prior to water use after the GAC tanks are replaced.

Maintenance at No Cost to You

Maintenance of POET systems in homes and commercial buildings is expected to continue until sampling data indicate well water treatment is no longer necessary. As the environmental investigation in the area continues and data indicate that a treatment system is no longer needed, DEC will either remove the system or turn over the system to the property owner, whichever the owner prefers. Property owners are not expected to pay the cost of POET system maintenance and water sampling and analysis.

Appendix C: Culligan PFAS System

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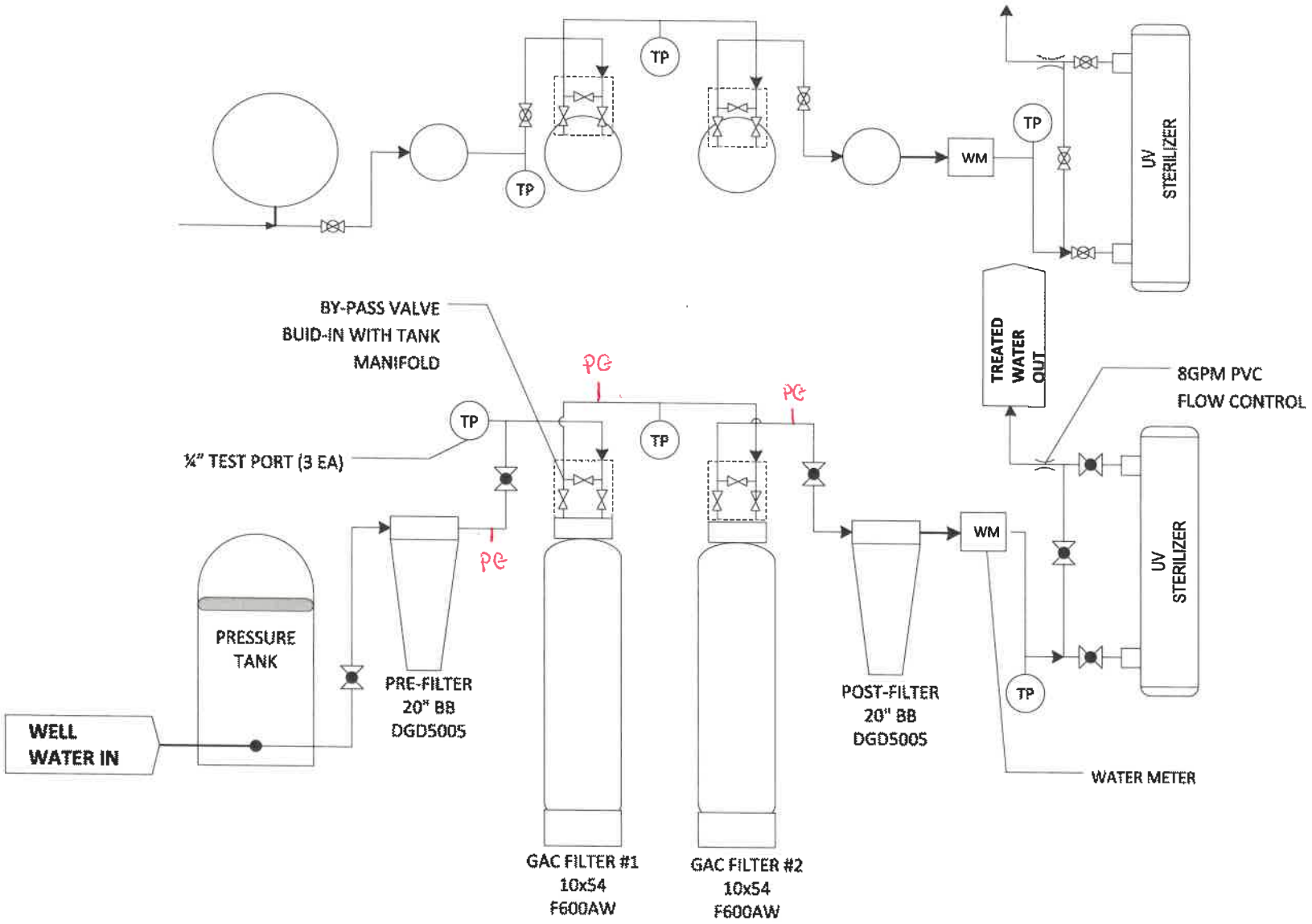
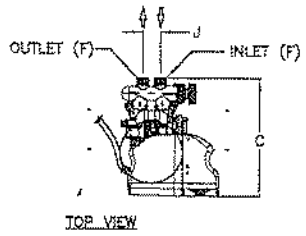
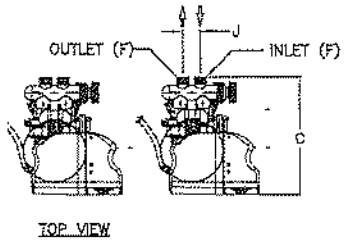


Culligan.	PFOA REDUCTION POE SYSTEM			
ENGINEERED SYSTEM ROSEMONT, IL USA	CULLIGAN PORTABLE EXCHANGE CARBON FILTER SYSTEM			
	SIZE	DATE 03-13-2016	DWG NO	REV

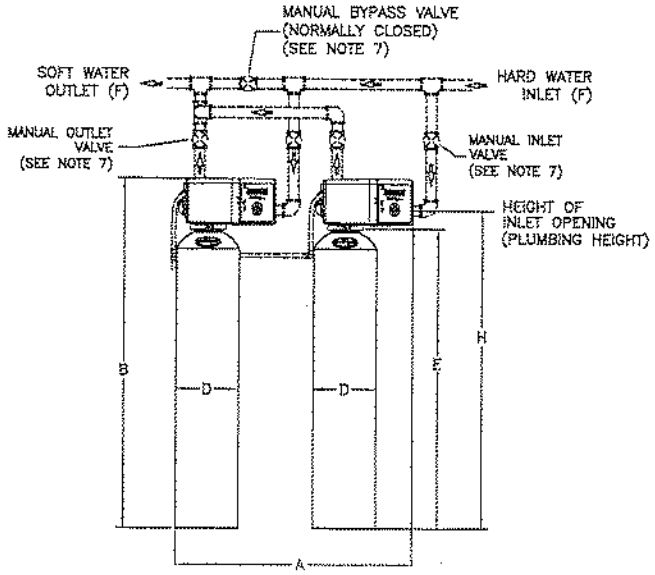
MODEL	WIDTH	HEIGHT	DEPTH	TANK DIA	SIDE-SHELL	INLET/OUTLET	RATED SERVICE FLOW	RESIN VOLUMN
	"A"	"B"	"C"	"D"	"E"	"J"		
10" DUPLEX	35"	60"	12"	11"	54"	1"	8.0 PGM	2 CUBIC FEET
10" Triplex	56"	60"	12"	11"	54"	1"	12 GPM	6 CUBIC FEET



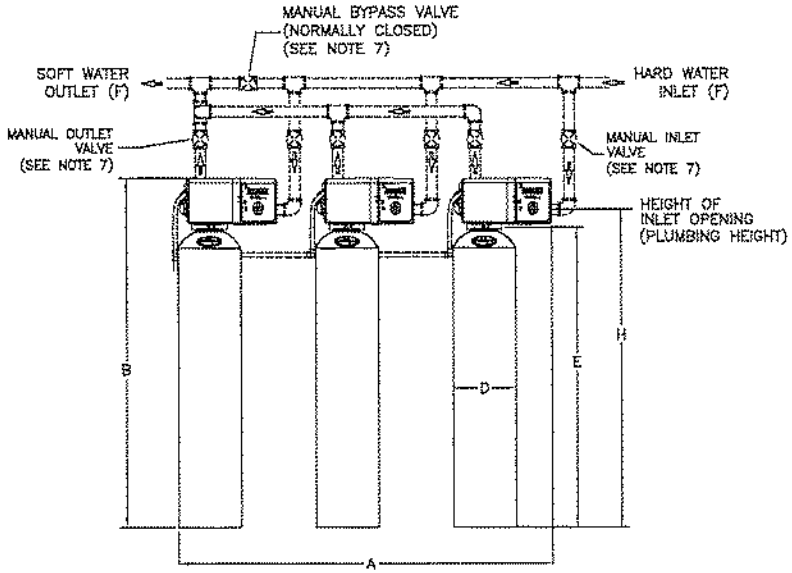
TOP VIEW



TOP VIEW



DUPLEX INSTALLATION



TRIPLEX INSTALLATION

These are the tanks that would be used, I had to cut and paste a few things together to get this to you. I would add 16" to the width for the Filter canisters that will need to go along with the system.

Appendix D: Mannik Smith Group Quote for Camp Grayling Filtration Units

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Form revision date: DMB-402 (R 10/06)
PIMS revision date: DMB-402 (R 05/08)

Contract Order

Department of Technology, Management and Budget, Facilities Admi

2nd Floor, Stevens T. Mason Building
P.O. Box 30026
Lansing, Michigan 48909

PSC Contract **Contract Order Number: Y22087**

Department
Military and Veterans Affairs

Agency/Institution:
DMVA/Grayling Home

Location:

File No: **511 / 22073 . SAR**

Project Name: **Water Filters Sampling & Replacement**

Project Scope:

Name and Address of Contractor

The Mannik & Smith Group, Inc.
2365 Haggerty Rd South Ste100
Canton MI 48188

CV0015423

Approval

Facilities Administration

January 7, 2022
Date

NOTICE TO CONTRACTOR: A. This CONTRACT serves as official notice that the State of Michigan will enter into a contract for the service or work described below and performed under the conditions of the respective CONTRACT. The order will not become effective until such a contract is executed. (AUTHORITY: 1984 PA31). B. The order number, account number, and name must be referenced when submitting billings for or correspondence about this order. C. A request for payment for service or work, either partial or final, must be submitted on a Payment Request form (DMB-440). The payment request must be appropriately supported in sufficient detail to explain and justify the amount requested. D. A CONTRACT CHANGE ORDER (DMB-403) must be approved and processed before payment will be made in excess of the amount(s) indicated. *No payment can be processed without federal identification or social security numbers.

Limited to the services and amounts indicated below **Description of Service or Work**

Professional services for: Phase(s) 100 professional services associated with the Grayling Homes Sites – Home Water Filters Sampling and Replacement in Grayling, Michigan.

Service		Compensation not to exceed	Multiplier	Total Compensation
PH 100 FEE	Direct Payroll	$45,190.00	1	$45,190.00
PH 100 REIM	Reimbursable	$126,815.34	1	$126,815.34
PH 200 FEE	Direct Payroll	$0.00	1	$0.00
PH 200 REIM	Reimbursable	$0.00	1	$0.00
PH 300 FEE	Direct Payroll	$0.00	1	$0.00
PH 300 REIM	Reimbursable	$0.00	1	$0.00
PH 400 FEE	Direct Payroll	$0.00	1	$0.00
PH 400 REIM	Reimbursable	$0.00	1	$0.00
PH 500 FEE	Direct Payroll	$0.00	1	$0.00
PH 500 REIM	Reimbursable	$0.00	1	$0.00
PH 600 FEE	Direct Payroll	$0.00	1	$0.00
PH 600 REIM	Reimbursable	$0.00	1	$0.00
PH 700 FEE	Direct Payroll	$0.00	1	$0.00
PH 700 REIM	Reimbursable	$0.00	1	$0.00
PH 800 FEE	Direct Payroll	$0.00	1	$0.00
PH 800 REIM	Reimbursable	$0.00	1	$0.00

Total Authorized: $172,005.34

Dept	Accounting Template	Unit	Loc	Obj	Dept Obj	Program
511	511ENVIROPROJ		1080			

Phase	Prog Period	Appropriation	Fund	Activity	Function

This Change: $172,005.34

Template Total
$172,005.34

	Contract Change
Revised Contract:	$172,005.34

Approved by the Director, Department of Management and Budget on 1/7/2022

Copies to: **Contract Office, File**

Company: **The Mannik & Smith Group, Inc.**
Agency: **Military and Veterans Affairs**
Project Director: **Sadi Rayyan**
Region Supervisor:

DTMB-0410 (R05/19)

DEPARTMENT OF TECHNOLOGY, MANAGEMENT AND BUDGET
STATE FACILITIES ADMINISTRATION

PROFESSIONAL SERVICES CONTRACT
INDEFINITE SCOPE INDEFINITE DELIVERY (ISID) ASSIGNMENT NO. 28

ISID Contract Number: **00768**
Department: 511 - Military & Veterans Affairs
File Number: **511/**22073.SAR
Contract Number: **Y** 22087
SIGMA Coding:
Project Name: **<Grayling Home Water Sampling and Filter Replacement - MDMVA>**

THIS ISID Assignment, authorized on the date below by the Director, Department of Technology, Management and Budget, is hereby made by and BETWEEN the STATE OF MICHIGAN acting through the STATE FACILITIES ADMINISTRATION of the DEPARTMENT OF TECHNOLOGY, MANAGEMENT AND BUDGET, 3111 W. St. Joseph St., Building 100, Lansing, Michigan 48917, hereinafter called the "State," and:

The Mannik & Smith Group, Inc.
2365 Haggerty Road South
Canton, Michigan 48188

SAR 1/3/22

the prime Professional Service Contractor, hereinafter called the "Professional," as listed above, hereby proposes to provide the services listed below:

<Quarterly sampling of systems within homes, operation and maintenance of systems in homes, installation of new filter systems in homes, changeout of filters with associated sampling in homes, and laboratory costs.>

STEP #MI515220001

Attached Appendices are part of this proposal. Please attach project schedule. The above shall be effective as of the date above. All other terms and provisions of the current ISID contract remain fully effective.

FOR THE PROFESSIONAL:

Signature

Walter J. Bolt/Program Manager
Printed Name/Title

30-Nov-21
Date

FOR THE STATE:

Director, Design & Construction, State Facilities Administration
Department of Technology, Management and Budget

January 7, 2021
Approval Date

28
Assignment #

COST/BUDGET SUMMARY

ASSIGNMENT NO. 28

ARTICLE 2 COMPENSATION

FILE NUMBER	INDEX NUMBER(S)	ISID NUMBER
511/22073.SAR	#REF!	768

PROJECT NAME

<Grayling Home Water Sampling and Filter Replacement - MDMVA>

FIRM NAME

The Mannik & Smith Group, Inc.

PHASE				COMPENSATION NOT TO EXCEED
100 Study	Personnel Costs	$	45,190.00	
	Reimbursements	$	126,815.34	
				$ 172,005.34 Total
200 Program Analysis	Personnel Costs	$	-	
	Reimbursements	$	-	
				$ 0.00 Total
300 Schematic Design	Personnel Costs	$	-	
	Reimbursements	$	-	
				$ 0.00 Total
400 Preliminary Design	Personnel Costs	$	-	
	Reimbursements	$	-	
				$ 0.00 Total
500 Final Design	Personnel Costs	$	-	
	Reimbursements	$	-	
				$ 0.00 Total
600 Construction Administration - Office	Personnel Costs	$	-	
	Reimbursements	$	-	
				$ 0.00 Total
700 Construction Administration - Field	Personnel Costs	$	-	
	Reimbursements	$	-	
				$ 0.00 Total
800 Supplemental Design	Personnel Costs	$	-	
	Reimbursements	$	-	
				$ 0.00 Total
TOTAL PROJECT COMPENSATION NOT TO EXCEED				**$ 172,005.34 Total**

Walter J. Bolt

SIGNATURE - PROFESSIONAL — DATE: 30-Nov-21

Sadi A. Rayyan

SIGNATURE - PROJECT DIRECTOR — DATE: 1/3/22

APPENDIX C

F. BID SHEET

REQUEST FOR COMPETITIVE BID – PACKAGE #2022-01
Grayling Home Water Sampling and Filter Replacements
MDMVA
Camp Grayling
Grayling, Michigan

Work Item	Units		Unit Cost	Events	Total Cost
Contract Management	1	lump sum	$0.00	1	$0.00
Health & Safety Plan	1	lump sum	$3,790.00	1	$3,790.00
Quarterly Home Water Sampling & Excel Spreadsheet	20	homes	$15,512.15	4	$62,048.60
Home Owner or MDMVA requested O&M or Issue[1]	1	each	$1,684.37	6	$10,106.20
Home Owner Scheduled Appointment – Owner No Show	1	each	$200.00	6	$1,200.00
Pre & Post Filter Replacement Home Water Sampling	2	samples	$3,150.57	15	$47,258.60
Home Water Filter Replacement[2]	1	filter	$1,258.95	15	$18,884.30
New Home Water Filter Installation & Plumbing[3]	1	each		6	
Water Filter Installation Plumbing New Filter into Whole Home Water Supply[4]	1	each	$4,786.27	6	$28,717.64
TOTALS					$172,005.34

[1]Materials are incidental to the work
[2]Materials needed after filtration system inspection are incidental to the work
[3]Includes labor, materials and filter
[4]Includes Labor, materials and plumbing required to fit filter into whole home water supply

The above bid table was adapted from the table provided in the Addendum dated November 11, 2021. The costs for installation of new whole home systems has been included in the "Water Filter Installation Plumbing New Filter into Whole Home Water Supply" task. The prior task listed on the bid table appears to be asking for the same information, and has therefore a price has not been listed for fear of duplicating costs in the total bid. The Breakdown of costs for the new whole home filter installation is as follows:

Plumber and Electrician Fees - $2,000.00
New Aquasana System Purchase - $1,907.99
Mannik Smith Management and Oversight Fees - $878.28

Total Purchase and Installation Cost: $4,786.27

PROPOSAL FOR

GRAYLING HOME WATER SAMPLING AND FILTER REPLACEMENTS

Camp Grayling
Grayling, Michigan
Package #2022-01

November 12, 2021

PREPARED FOR

MDMVA Environmental
Curt Roebuck
FCTC ENV Manager
Environmental Section
2510 26th Street
Augusta, MI 49012

Mannik Smith GROUP

January 30, 2020

Curt Roebuck
FCTC ENV Manager
MDMVA Environmental
Environmental Section
2510 26th Street
Augusta, MI 49012

RE: Grayling Home Water Sampling and Filter Replacements
Camp Grayling – Grayling, Michigan
Package #2022-01

Dear Mr. Roebuck,

The Mannik & Smith Group, Inc. (MSG) is pleased to have received your Request for Competitive Bid (RFB) to provide professional environmental services to the Michigan Department of Military and Veterans Affairs (MDMVA) & Michigan Army National Guard (MIARNG). MSG acknowledges receipt of Bid Addendum and Questions with Answers dated November 10, 2021.

We are a full service environmental consulting and engineering firm that has a long and successful track record in managing large environmental contracts for both private and governmental clients including, but not limited to, the services identified in the subject RFB. MSG is strategically located across Michigan to serve all 10 Prosperity Regions with offices in Canton, Adrian, Detroit, Grand Rapids, Houghton, Lansing, Monroe, and Traverse City.

We are thoroughly familiar with environmental regulatory requirements and contractual procedures of Michigan Department of Environment, Great Lakes and Energy (EGLE), Department of Health and Human Services (DHHS), and Department of Technology, Management and Budget (DTMB). MSG has conducted PFAS investigation and mitigation measures at numerous sites throughout Michigan. MSG is proficient with the collection, preservation, storage, and delivery for all types of environmental samples. MSG owns and maintains various state-of-the-art sampling equipment and follows manufacturer and state recommended sampling procedures. MSG has conducted in-home surveys and collected PFAS samples from residences with whole-house filtration systems for the treatment of PFAS impacted water at the Wolverine Worldwide Site under the U.S. Environmental Protection Agency (EPA) Superfund and Technical Assistance Response Team (START) contract as well as many other sites across the state.

Presently, MSG's Geoenvironmental staff workload is 15 percent below our optimum capacity and we have sufficient available staff resources to take on assignments under this contract.

We are confident you will find this proposal and our firm a top candidate to perform the requested environmental services. Your time and effort associated with review of our professional qualifications and services are sincerely appreciated. Please contact the undersigned if there are any additional questions. MSG is fully committed to providing professional services under this contract and we look forward to an opportunity to serve the MDMVA and the MIARNG.

Respectfully submitted,
The Mannik & Smith Group, Inc.

William J. Prall, CPG
Senior Project Manager

Walter J. Bolt, CPG
Senior Vice President

Attachments

CC: Patricia Byrnes Lyman
PFAS Lead/Investigation/Remediation Manager
MDMVA Environmental- Joint Forces Headquarters

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Appendices

Appendix A – Key Staff Resumes
Appendix B – PFAS Sampling Guidance

Sadi A. Rayyan

A. PROJECT UNDERSTANDING

The Mannik and Smith Group, Inc. (MSG) will serve as a representative of MDMVA and assist in providing professional environmental services which include quarterly sampling of home water systems, water sampling before and after system filter replacements, operation and maintenance (O&M) response within 24 hours of notification, and filter replacement within 24 hours of notification. Additionally, MSG personnel will purchase, and oversee the installation of six (6) complete Asquasana OptimH2O filter systems. The overall objective of the sampling and monitoring program is to collect sufficient data to assist MDMVA in evaluating treatment system operation in residential and commercial properties located near the Camp Grayling facility.

Specific objectives of the project are:
Task 1 – Contract Management
Task 2 – Preparation of a Health and Safety Plan (HASP)
Task 3 - Quarterly Home Water Sampling and Data Management
Task 4 – Home Water O&M with 24 hour response
Task 5 – Pre and Post Filter Replacement Sampling
Task 6 – Home Water Filter Replacement
Task 7 – New Home Water Filter Installation and Plumbing

The following sections provide our understanding of the scope of work and assumptions for each task.

Task 1: Contract Management

Under this task, MSG's experienced and capable staff will provide contract management throughout all phases of this project. Contract management will include preparation of contract documents (DTMB form 0410) along with project work plans, schedules, cost estimates for DMVA review and approval; routine correspondence with MDMVA contract and project personnel; preparation of monthly progress reports including invoices; subcontractor, equipment and materials procurement; and assignment of adequate resources to ensure the project is successfully delivered. Contract management will also include site specific training for MSG personnel as well as preparation of response plans when necessary to complete the above-referenced tasks in conformance with the RFB.

Task 2: Preparation of a Health and Safety Plan

MSG personnel will prepare a detailed site-specific HASP for the project based on available information that complies with the Occupational Safety and Health Administration requirements (29 CFR 1910.120 and 1926, the Michigan Occupational Safety and Health Act (P.A. 154 of 1974), and other applicable local, state, and federal regulations and guidelines outlined in the US Army Corps of Engineers EM 385-1-1.

In light of the recent pandemic, MSG has developed a set of safety measures to address concerns related to spread of the coronavirus (COVID-19) respiratory virus. These safety measures will be included in the HASP. MSG has received and reviewed the Michigan Department of Labor & Economic Opportunity Return to Work Guidelines for Construction and will follow those guidelines in the HASP and during all site work.

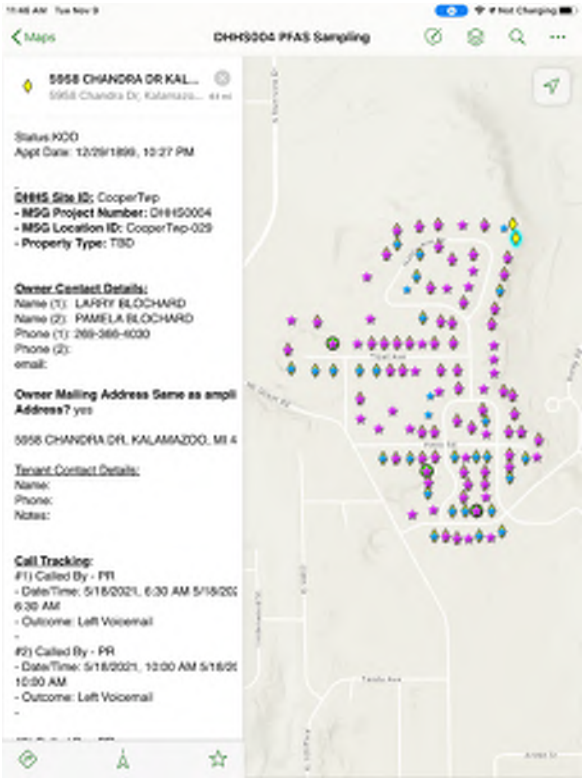
Task 3: Quarterly Home Water Sampling and Data Management

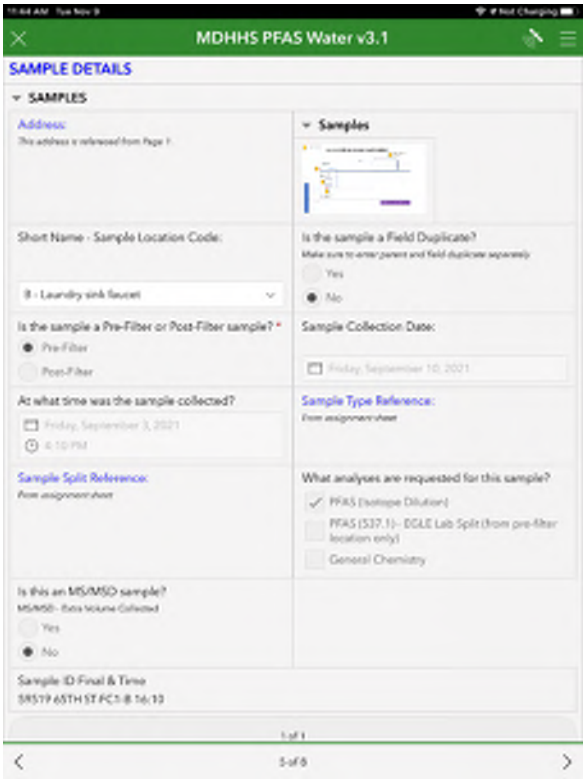
MSG understands the MDMVA has provided water filters to residences, a church, and a women's shelter near Camp Grayling in Grayling, Michigan. As part of this task, MSG will perform quarterly sampling of each water at both the influent and effluent sides of the filtering systems. Samples will be collected in accordance with the EGLE *General PFAS Sampling Guidance Document* prepared revised 10/16/2018, and the October 26, 2020 *Michigan PFAS Action Response Team Continuity of Operation Plan for Residential Well Sampling*. Both have been included in Appendix B.

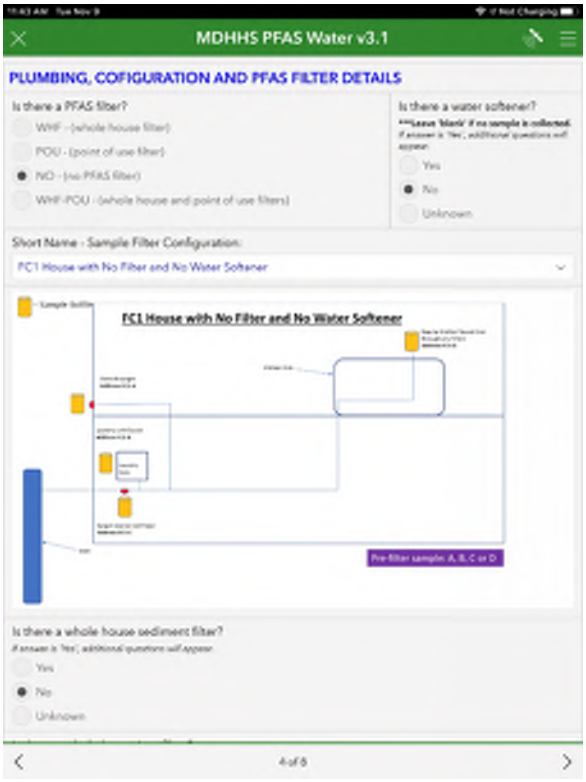
This task includes coordination with MDMVA staff, coordinating access with residents, and preparing for, sampling and shipping samples to the Vista Analytical Laboratory located at 1104 Windfield Way El Dorado Hills, CA 95762. In accordance with the Addendum dated November 10, 2021, MSG personnel will plan to collect pre and post filter samples from 20 systems during each quarterly event, for a total of 40 samples per event (160 samples total). Additionally, as prescribed by MDMVA, MSG will collect duplicate samples every 10th sample (4 additional samples). In total, 44 samples will be submitted to the laboratory during each sampling event (a total of 176 samples for the 12 month contract period). Following receipt of the laboratory data, MSG will provide the data to a qualified chemist for review prior to publishing results. MSG has chosen to partner with Cadena, LLC. James Tomalia, of Cadena, will serve as lead data validation specialist with support provided in-house by Heather Crandall & Nancy Posavatz.

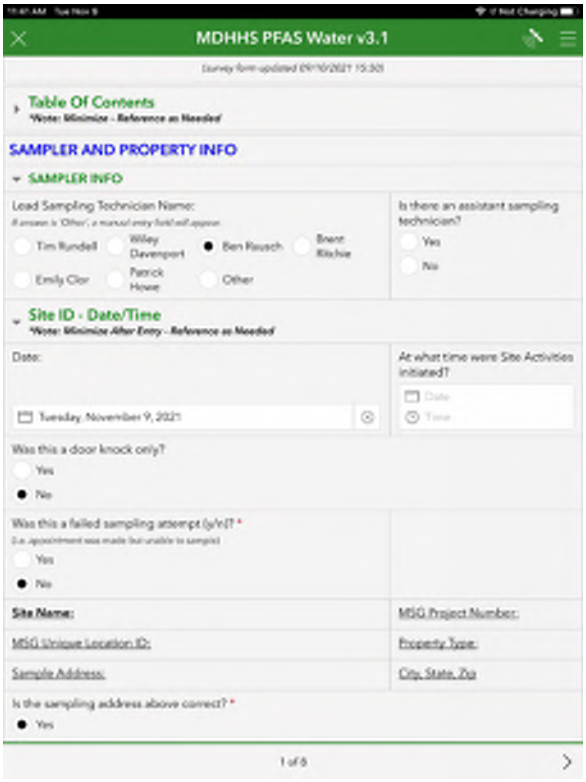
In addition to sample collection, MSG will complete in-home surveys with residents to collect background information on the filter status and other information required for public health investigations and determinations.

MSG will develop a project-specific electronic field data collection form, in conjunction with ArcGIS Online and Survey 123, which can be uploaded in near real-time on most mobile devices. Information such as, sampling information, and photographs can be collected in the field and then submitted to a cloud service on ArcGIS Online. Controls will be put in place requiring input of an answer to critical questions in the form, ensuring that each survey is complete before being submitted. Once in ArcGIS Online, data can be downloaded and utilized by both MSG and MDMVA for many purposes. For example, sample information can be automatically populated into chain-of-custody forms used to submit samples to the laboratory. In-home surveys and sampling information are then available in almost real-time without the added step of scanning or digitizing. These forms are also highly customizable and can be updated or changed to meet the needs of specific sampling events or as the work evolves. MSG has found that in large-scale projects, such as this, electronic field data collection systems have significantly increased efficiencies and minimized errors. Below are examples of the Survey 123 field forms utilized by MSG for MDHHS PFAS sampling events:









Task 4: Home Owner or MDMVA Requested O&M or Issue

In accordance with the RFP, MSG has assumed that up to six (6) O&M events may need to occur in the contracts 12 month period. MSG understands that work performed under this task must be completed by a licensed contractor in accordance with local and state building code(s), and must be initiated within 24 hours of the requests from the Home Owner or MDMVA. The responding contractor will have basic plumbing and/or electrical parts readily available to correct the situation during the response. If it is determined that the filter needs replacing, the responder will contact the MDMVA POC to obtain authorization and coordinate water sampling and filter replacement within 48 hours.

Task 5: Pre and Post Filter Replacement Water Sampling

Performance confirmation water samples will be collected (a) prior to filter cartridge replacement and (b) a second set of samples (post-replacement) shall be collected no less than 3 and no more than 4 days after cartridge replacement. Samples will be collected and documented in accordance with Task 3. Samples will be shipped on ice under chain of custody documentation to Vista Analytical Laboratory located at 1104 Windfield Way El Dorado Hills, CA 95762 for standard turn time analysis for PFAS compounds. In accordance with the RFP, 15 sampling locations with two samples per location will occur during the contract period. This equates to 30 samples plus 3 duplicate samples for a total of 33 samples submitted for analysis.

Task 6: Filter Replacement

MSG personnel will provide a licensed plumber or other qualified individual to perform filter cartridge replacement based on the filter indicator light status as reported by the home owner(s), or quarterly sampling results. Prior authorization will be obtained from the POC prior to initiation of filter change outs. Pre and post filter replacement sampling will be performed as discussed in Task 5 above. The RFP suggests that 15 filters will be replaced during the

course of the contract period. MSG, under direction of the POC, will purchase 15 filters to have on hand if selected as the contractor for this project to insure that filters are available in a timely fashion for change outs. Costs have also been included for replacement of sediment filters in addition to the EQ-OPTM-R primary filter. The manufacturer recommends replacement of the sediment filter every 6 months.

Task 7: New Whole Home Filter System Installation

As investigation data is evaluated, additional locations may require filter system installation. The POC will coordinate with the contractor and provide authorization and location/contact details. Initial contacts with the homeowner/representative will be made by MDMVA staff.

MSG and its plumbing and electrical contractors will make a prearranged visit to the site to identify an optimal location for the filter installation (agreed upon by the homeowner or representative). During this visit MSG personnel will at a minimum evaluate the physical location, current layout of mechanical systems, existing electrical outlets in the proposed location (the filter system must be plugged into a GFI outlet in the immediate vicinity of the unit), accessibility of the location for future filter cartridge replacements; as well as measure the diameter of existing water pipes that the filter unit will be joined to. Because the filter units are not freeze resistant, the installation location will be in a heated location or all waterlines and the unit itself will be wrapped with heat tape to prevent freezing. MSG's contractor will install a GFI outlet near the unit if one is not already located in close proximity.

MSG personnel will develop an initial sketch/diagram showing filter system layout (piping/electrical) and supply this to MDMVA staff for review, and for inclusion in the Survey 123 database for future sampling. Systems will not be installed prior to receiving written approval from MDMVA. MSG's trade contractors will identify, obtain and pay for any and all permits required by the City or Township (i.e. plumbing and electrical, and all others deemed necessary by the City or Township). All work conducted as part of the installations will be conducted by the appropriate licensed professional (plumber, electrician etc.).

Photo documentation of the completed installations will be prepared by MSG which will include no less than 4 photos encompassing all portions of the filter unit and all piping changes/additions. Photos will be provided in a format which includes installation location, date installation was completed, individual photo descriptions, and name of installer(s). Photo packets shall be provided to the MDMVA POC within 2 weeks of completion.

All materials used during the installation will be PFAS-free and Teflon-free including but not limited to pipe thread tape, pipe joint adhesives/solvents, piping, valves, and valve parts. MSG's plumbing contractor will install shut off valves and by-pass piping to allow for isolation and draining of the filter system as needed during cartridge replacement or repairs. MSG's plumbing contractor will install MDMVA approved sampling ports before and immediately after the filter unit to allow for easy sampling of the incoming well water and filtered water. These sampling valves will be installed in locations that allow easy access by sampling personnel. All materials not supplied by the filter unit manufacturer must by review and approved by MDMVA staff prior to use. It has been noted that the Aquasana filter system comes factory installed with a valve that contains a Teflon ball. This valve will be replaced during the manufacturing process, and prior to installation of the system. MSG will coordinate with Aquasana technical and sales personnel to ensure that no Teflon materials are contained in or part of the filter unit systems that will be used during this project. Additionally, a sediment filter will be installed as part of the system per the RFP.

B. PROJECT ACKNOWLEDGEMENTS

- MSG acknowledges and will meet the time constraints in the schedule.
- MSG acknowledges the responsibility for all permits that may be required for new home filter installations.
- MSG acknowledges water samples will be analyzed by Vista Analytical Laboratory in El Dorado Hills, CA.

C. QUALITY ASSURANCE/QUALITY CONTROL

MSG understands the criticality of quality for successful project implementation. Our Quality Assurance/Quality Control (QA/QC) program and protocol demonstrates our commitment to quality and our understanding of the importance in providing quality data to MDMVA. Our QA/QC program is designed to meet the technical requirements and expectations of the EGLE, ensuring the reliability of data and improving efficiency during project implementation.

During sampling and monitoring, to ensure that high quality are data obtained, appropriate QA/QC measures will be followed for sample collection and monitoring. Items that will be addressed in sampling protocols include sampling techniques, certified-clean sampling apparatus, appropriate sample holding times, temperatures, and pressures. In addition, field documentation (sample collection information and locations), Chain-of- Custody, field blanks, trip blanks, field sample duplicates will be collected as appropriate. Unless otherwise dictated by MDMVA, field QA/QC measures will include the collection of one duplicate sample for every 10 investigative samples.

For the purposes of this contract, a description of our QA/QC program includes the following:

Quality Organization /Project Planning and Management

Quality is a team effort. Professionals at each level are responsible for maintaining the corporate quality consistency on every task performed. To ensure quality throughout the project, each assigned professional will report directly through a QA/QC chain of command to allow for continual quality assurance checks, modifications for improvement and consistency/defensibility of data.

The MSG PM will develop a project specific Work Plan, Quality Assurance Project Plan (QAPP) and Health & Safety Plan (HASP) and incorporate all specific QA/QC requirements for a this project. Prior to initiating field activities, a project kick-off meeting will be conducted to include all project personnel assigned. Specific project assignments, responsibilities and project objectives, along with the QA/QC procedures and objectives will be discussed.

QA/QC Field/Site Sampling Procedures

MSG has developed SOPs documenting the routine and non-routine field sampling and construction oversight activities. The SOPs were developed in accordance with applicable State and Federal guidance documents for environmental sampling. MSG is also thoroughly familiar with all EGLE protocols and procedures as amended in the newly updated EGLE Part 201/213 Operational Memoranda, especially since we have staff currently serving as a technical review team member.

All in-house MSG field equipment is continually maintained in accordance with manufacturer's specifications. Prior to initiating field activities, the assigned field team leader will inspect each instrument and perform functional testing to ensure the equipment is in working order. Proper calibration of field instrumentation is an essential component of quality field documentation. At a minimum, field equipment will be calibrated in accordance with the manufacturer's recommendation. Calibration procedures will be documented to ensure the integrity of field information collected.

Sample chain-of-custody will be maintained from collection to final reporting. Proper chain-of-custody is essential to provide evidence of the traceability of a sample through collection, shipment, laboratory receipt, and laboratory custody without alteration.

QA/QC Laboratory Data Review Procedures

MSG has teamed with Cadena, Inc. (Cadena) to provide a prompt, independent, third-party review of laboratory analytical data reports by a qualified chemist.

Cadena will ensure that Vista Analytical Laboratory provides sufficient documentation to demonstrate that SOPs were followed, data calculations were accurate, QC samples were prepared and analyzed in the same manner as field samples (as applicable), and corrective actions were taken and documented as appropriate.

Any sample condition, laboratory/data QC failures, unusual data qualifiers or other issue identified will be investigated and discussed with the lab upon data report receipt. Any issues or exceptions identified in the data reports that may impact data validity, reliability, or usability will be summarized in a memorandum including what corrective measures were taken and/or the implications of the issue in terms of data quality and usability.

Vista Analytical Laboratory will be instructed to send laboratory analytical data reports directly to MSG's Project Manager, our qualified chemist (Cadena) and Patricia Lyman of MDMVA.

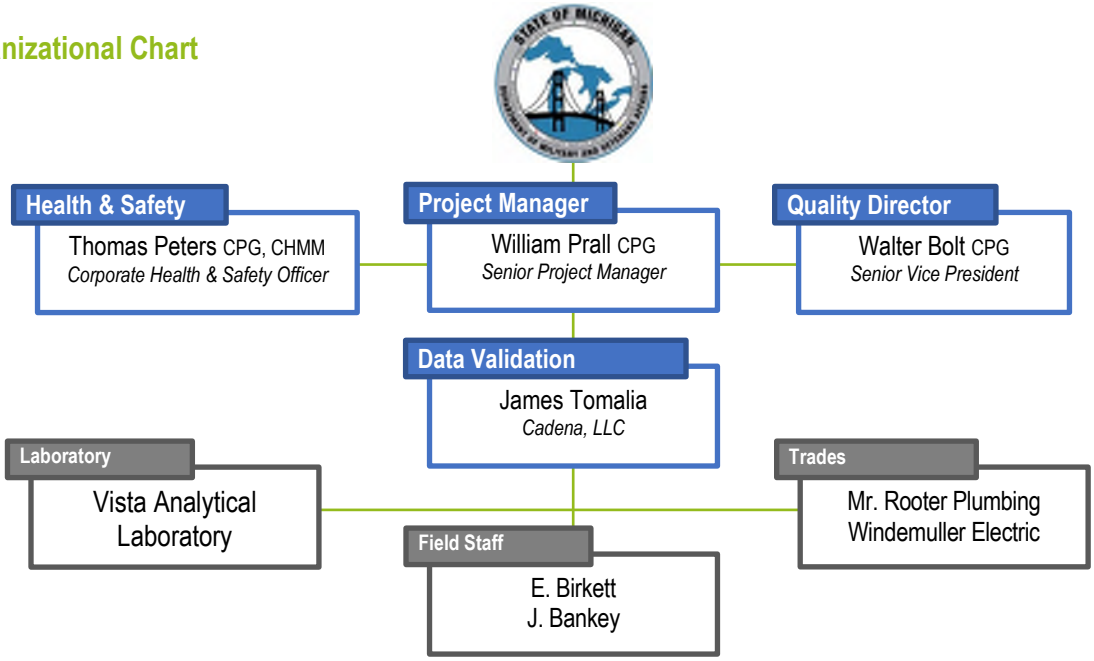
D. PROJECT TEAM

MSG has assembled a highly qualified project team possessing the talent and skills necessary to achieve the successful completion of the project. An organizational chart including key project personnel is presented as the MSG Project Team Organizational Chart.

Point of Contact/Manager for the Project

MSG's experienced Project Manager, **William (Bill) Prall, CPG**, will serve as the MSG Project Manager (PM) and will act as the main point of contact with the MDMVA to ensure continuity from project start to finish. He can be reached in our Traverse City office at (231) 929-7330, by cell at (231) 343-3483, or via email at wprall@manniksmithgroup.com.

Organizational Chart



MSG proposed field teams are designed to provide project continuity and flexibility to provide the requested services contemplated under this RFB across all prosperity regions.

Key Staff

Mr. Walter J. Bolt, CPG will serve as the Program Quality Director (PQD) for this project. The PQD is responsible for ensuring that all appropriate QA/QC procedures are followed and maintained for each project assigned under this contract. Mr. Bolt has over 28 years of environmental engineering and management experience. He was key to the development of the corporate quality manual and is thoroughly familiar with the QA/QC checks and procedures necessary to deliver the successful completion of environmental projects. Mr. Bolt will provide QA oversight during the duration of the project. He will perform periodic QA reviews at project initiation, during field implementation and at critical project milestones through completion.

As the Project Manager, Mr. William (Bill) Prall, CPG will be responsible for all aspects of the project and act as the point of contact with the MDMVA project manager (PM) to ensure communication and continuity from project start to finish. PM duties will include, but not be limited to: coordination of the assigned project team; development of work plans; cost estimates and schedules; tracking budgets; coordination with task managers and field/support staff; preparation of required project deliverables; QA/QC review of invoices, documents and submittals. The PM will interface directly on a daily basis with the PQD, project technical specialists and field staff to ensure QA/QC objectives are achieved to the satisfaction of the MDMVA.

PFAS / Data Validation Specialists: MSG has chosen to partner with Cadena, LLC. James Tomalia, of Cadena, will serve as lead data validation specialist with support provided in-house by Heather Crandall & Nancy Posavatz. These specialists have relevant skills, training and project experience to provide technical expertise and guidance to ensure precise, accurate and quality data collection and project deliverables. Our selected technical specialists will be available to support the project throughout the duration of the project.

Field Staff: MSG field staff, under the supervision of the PM will be responsible for executing field activities. Our field staff have been trained in the most up-to-date sampling techniques and are thoroughly familiar with following State and Federal methodologies and regulations.

Resumes for all key personnel for services to be performed under this contract are included in Appendix A.

Licensed Electric / Plumbing Contractors

MSG has teamed with Windemuller Electric of Traverse City, Michigan and Mr. Rooter Plumbing of Kalkaska, Michigan for electrical and plumbing services. Windemuller has assisted MSG in the installation of remedial system throughout Northern Michigan for the past 12 years. Mr. Rooter Plumbing has been contracted by the District Health Department #10 for installation of filter systems in Grayling and other areas within the district for treatment of PFAS contaminants in groundwater. They have experience in the installation of point source filters and whole house filtration systems. Windemuller's Master Electrician is David F. Beemer. His License number is #6105745. Mr. Rooter's license is #8001236.

E. PROJECT EXPERIENCE AND REFERENCES

Presented below are representative projects that outline the breadth of MSG's experience related to the services requested in this RFP.

F. BID SHEET

REQUEST FOR COMPETITIVE BID – PACKAGE #2022-01
Grayling Home Water Sampling and Filter Replacements
MDMVA
Camp Grayling
Grayling, Michigan

Work Item	Units		Unit Cost	Events	Total Cost
Contract Management	1	lump sum	$0.00	1	$0.00
Health & Safety Plan	1	lump sum	$3,790.00	1	$3,790.00
Quarterly Home Water Sampling & Excel Spreadsheet	20	homes	$14,952.15	4	$59,808.60
Home Owner or MDMVA requested O&M or Issue[1]	1	each	$1,684.37	6	$10,106.20
Home Owner Scheduled Appointment – Owner No Show	1	each	$200.00	6	$1,200.00
Pre & Post Filter Replacement Home Water Sampling	2	samples	$1,222.57	15	$18,338.60
Home Water Filter Replacement[2]	1	filter	$1,258.95	15	$18,884.30
New Home Water Filter Installation & Plumbing[3]	1	each		6	
Water Filter Installation Plumbing New Filter into Whole Home Water Supply[4]	1	each	$4,786.27	6	$28,717.64
TOTALS					$140,845.34

[1]Materials are incidental to the work
[2]Materials needed after filtration system inspection are incidental to the work
[3]Includes labor, materials and filter
[4]Includes Labor, materials and plumbing required to fit filter into whole home water supply

The above bid table was adapted from the table provided in the Addendum dated November 11, 2021. The costs for installation of new whole home systems has been included in the "Water Filter Installation Plumbing New Filter into Whole Home Water Supply" task. The prior task listed on the bid table appears to be asking for the same information, and has therefore a price has not been listed for fear of duplicating costs in the total bid. The Breakdown of costs for the new whole home filter installation is as follows:

Plumber and Electrician Fees - $2,000.00
New Aquasana System Purchase - $1,907.99
Mannik Smith Management and Oversight Fees - $878.28

Total Purchase and Installation Cost: $4,786.27

If an additional six system are required for installation, they would be charged at $4,786.27 per home. If only systems are required to be purchased, they would be at a cost of $1,907.99 based on the current pricing from the manufacturer.

APPENDIX B

PFAS SAMPLING GUIDANCE

GENERAL PFAS SAMPLING GUIDANCE

This document contains an introduction to PFAS, biosecurity recommendations, and general recommendations to decrease the possibility of cross-contamination.

Michigan Department of Environmental Quality

Revised 10/16/2018

GENERAL PFAS SAMPLING

Guidance

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Acronyms

Acronyms used throughout the **General PFAS Sampling Guidance** document and/or each sampling guidance are as follows:

AFFF – Aqueous film forming foam
CAS Number – Chemical abstracts service number
COC – Chain of Custody
DEPA – Danish Environmental Protection Agency (Denmark)
EINECS – European List of Notified Chemical Substances (European Union)
ENCS – Existing and New Chemical Substances Inventory (Japan)
ETFE – Ethylene-tetrafluoroethylene
FCMP – Fish Contaminant monitoring program
FCSV – Fish consumption screening values
FDA – Food and Drug Administration (United States of America)
FEP – Fluorinated ethylene propylene
HASP – Health and Safety Plan
HDPE – High-density polyethylene
IECSC – Inventory of Existing Chemical Substances Produced or Imported in China
ITRC – Interstate Technology & Regulatory Council
KECI – Korea Existing Chemicals Inventory (South Korea)
KEMI – Swedish Chemical Agency (Sweden)
LDPE – Low-density polyethylene
LHA – Lifetime Health Advisory (United States Environmental Protection Agency)
MDEQ – Michigan Department of Environmental Quality
MDHHS – Michigan Department of Health and Human Services
MPART – Michigan PFAS Action Response Team
MSDS – Material Safety Data Sheet (former reference)
ng/L – Nanograms per liter
NZIoC – New Zealand Inventory of Chemicals (New Zealand)
PCPs – Personal care products
PID – Photoionization detector
PFAA – Perfluoroalkyl acids
PFAS – Per- and Polyfluoroalkyl Substances
PFC – Polyfluorocarbons
PFCA – Perfluoroalkyl carboxylic acids
PFOA – Perfluorooctanoic acid
PFOS – Perfluorooctanesulfonic acid
PFPE – Perfluoropolyethers
PFSA – Perfluoroalkyl sulfonic acids
PICCS – Philippine Inventory of Chemicals and Chemical Substances (Philippines)
ppb – Parts per billion
PPE – Personal protection equipment
ppt – Parts per trillion
PTFE – Polytetrafluoroethylene
PVC – Polyvinyl chloride
PVDF – Polyvinylidene fluoride
PVF – Polyvinyl fluoride
QA/QC – Quality assurance/quality control
QAPP – Quality Assurance Project Plan
OECD – Organization for Economic Cooperation and Development
SDS – Safety Data Sheet
SWAS – Surface Water Assessment Section (MDEQ)
TSCA – Toxic Substances Control Act (United States of America)
USEPA – United States Environmental Protection Agency
UV – Ultraviolet
VOC – Volatile organic compounds
WRD – Water resources division (MDEQ)

Disclaimer

The Michigan Department of Environmental Quality (MDEQ) intends to update the information contained within this PFAS Sampling Guidance document as new information becomes available. The user of this PFAS Sampling Guidance is encouraged to visit the Michigan PFAS Action Response Team webpage (www.michigan.gov/PFASresponse) to access the current version of this document.

1. Introduction

Per- and polyfluoroalkyl Substances (PFAS) are a class of **emerging contaminants** composed of more than 3,000 human-made, fluorinated, organic chemicals (Buck et al., 2011, Wang et al., 2017). The actual number of compounds is continuously changing, as some PFAS are no longer produced due to regulatory and voluntary actions, while new ones are created as alternatives. The carbon-fluorine bond that exists in PFAS is one of the strongest bonds in nature, they are tough to break and are resistant to thermal, chemical, and biological degradation.

NOTE: Emerging Contaminants are chemicals and materials in the environment and present real or potential human health or environmental risks, and either…

- Do not have peer-reviewed human health standards
  or:
- Standards/regulations are evolving due to new science, new laboratory analytical capabilities, and new knowledge about the chemicals.

Due to their unique chemical properties, various PFAS can lower surface tension (act as surfactants), are oil-repelling (oleophobic), and are water-repelling (hydrophobic), yet are also relatively water soluble. They have been used extensively in many industries worldwide for a wide variety of applications. PFAS were first invented in the late 1930's and commercially used from the 1940's as non-stick coatings. PFAS continued to be used in many industries and various products as more PFAS were developed with unique chemical properties. Some of the documented PFAS uses are in hydraulic fluids, biocides, construction products, fire-fighting foams, household products, wetting and mist suppressing agents, surfactants for oil and natural gas recovery enhancement, polymerization agents, low-friction bearings and seals, insulators, cables, wires, protective coatings for a wide variety of materials, nonstick coatings, surgical patches, cardiovascular grafts, implants, oil and water repellent coatings for a wide range of materials such as paper and cardboard packaging products, carpets, leather products, and textiles (OECD, 2013). The presence of PFAS in these materials is a potential source of environmental concern and cross-contamination.

The probability of false positives is relatively high during PFAS sample collection due to the potential for many sources of cross-contamination, combined with low laboratory detection limits (nanograms per liter (ng/L) or parts per trillion (ppt)). There are many products that could be found in the sampling environment, that have not been documented to either contain or not contain PFAS, and may come into contact with the samples, introducing causing cross-contamination.

The United States Environmental Protection Agency (USEPA) has established a Lifetime Health Advisory (LHA) for Perfluorooctanoic acid (PFOA) and Perfluorooctanesulfonic acid (PFOS), separately or combined, of 70 ppt. The MDEQ cleanup criteria protective of groundwater used for drinking water purposes is also 70 ppt for PFOS and PFOA, individually or combined. The MDEQ has also promulgated a standard under Rule 57 for PFOS of 11 ppt for surface water that is used as a drinking water source and 12 ppt for surface water that is not used as a drinking water source.

2. Purpose and Objectives

The purpose of this document is to provide guidance and information to staff who will:

- Collect or handle PFAS environmental samples.
- Perform subsurface activities such as soil borings and/or well installation or well abandonment at PFAS sites.

This document is intended to supplement the MDEQ media-specific PFAS sampling guidance documents and is a resource for PFAS sampling.

The objectives of this document are as follows:

- Provide guidance on avoiding PFAS cross-contamination during sampling.
- Improve sampling consistency and data quality.
- Provide guidance to MDEQ staff and contractors.

Because PFAS are emerging contaminants and information about their use in various materials is still not available; the MDEQ will update this document as new information becomes available.

NOTE: This guidance does not include specific information for sampling environmental media and should not be used to replace specific sampling guidance documents required for use by MDEQ staff.

3. Farm Biosecurity

In the event PFAS sampling occurs on or near a farm, staff need to follow the requirements in this document when conducting sample collection, to reduce the likelihood of transporting animal diseases.

3.1 Scheduling

To avoid cross-contamination from previous sampling locations, it is preferable that staff visit only one farm in a day.

3.2 Before Sampling

Staff should review **Section 4.2.4. Field Clothing and Personal Protective Equipment (PPE)** before going into the field.

Staff must have a clean vehicle, clean clothing, and clean boots to visit the sampling location. Before arriving at the farm, staff should call the owner of the farm to indicate they will be arriving shortly and ask if there are any additional biosecurity requirements for their farm. Once at the farm, staff should park away from any animals and barns; preferably in a designated visitor area or on concrete.

Immediately before exiting the vehicle, place disposable PFAS-free boot covers over boots. (*NOTE: Disposable boot covers can be slippery, especially in icy/snowy conditions.*)

3.3 While Sampling

Staff should not approach animal areas unless necessary for testing. If access to an animal area is needed, staff should always be accompanied by farm personnel.

3.4 After Sampling

Dispose of used disposable boot covers at the facility if possible; otherwise, place in a plastic bag, seal and place in the vehicle trunk to dispose of properly later.

4. General PFAS Sampling

The following sections discuss technical issues such as the need to use PFAS-free water; information about PFAS-free clothing and PPE; and laboratory issues that should be considered when sampling for PFAS.

4.1 Sampling Objectives

Before conducting any PFAS sampling, it is recommended that a project-specific Quality Assurance Project Plan (QAPP) should be developed. The QAPP must meet MDEQ policy and should include the analyte list, method of analysis, environmental matrices, and reporting limits, which are based on the project objectives. All of these considerations will be discussed in more detail in this guidance document.

4.2 PFAS Cross-Contamination Potential Sources

Potential sources of PFAS cross-contamination in the typical sampling environment include water used during drilling or decontamination, materials used within the sampling environment, sampling equipment, field clothing and personal protective equipment (PPE), sun and biological protection products, personal hygiene and personal care products (PCPs), food packaging, and the environment itself.

The materials associated with sampling that have the potential for PFAS cross-contamination have been divided into three major groups:

- Prohibited (●) identifies items and materials that should not be used when sampling. It is well documented that they contain PFAS or that PFAS are used in their manufacture.

- Allowable (■) identifies items and materials that have been proven not to be sources of PFAS cross contamination and are considered allowable for sampling.

- Needs Screening (▲) identifies items and materials that have the potential for PFAS cross-contamination due to a lack of scientific data or statements from manufacturers to prove otherwise. These items and materials are further sub-divided into two categories:

    - **Category 1:** Items and materials that <u>will come in direct contact</u> with the sample. These should not be used when sampling unless they are known to be PFAS-free, by collecting an equipment blank sample prior to use.

    - **Category 2:** Items and materials that <u>will not come in direct contact</u> with the sample. These should be avoided, if possible, unless they are known to be PFAS-free by collecting an equipment blank sample prior to use.

All of the materials or items discussed in each of the MDEQ's PFAS Sampling Guidance Documents will be divided into ● Prohibited ■ Allowable, or ▲ Needs Screening. Several examples of prohibited and allowable materials and materials that need screening are listed in the **MDEQ PFAS Sampling Quick Reference Field Guide** at the end of this document. Also, materials and items that are specific to a particular environmental media or sampling method will be thoroughly explained in that media's sampling guidance document (such as peristaltic pumps for groundwater sampling).

NOTE: If recommended PPE will be used during sampling, **Category 2** materials are not expected to be a source of cross-contamination as long as they do not come into contact with the samples.

●- Prohibited ■- Allowable ▲- Needs Screening

Please note that at this time no published research is available that documents the use of various materials and their effect on sample results. Therefore, a conservative approach is recommended in this guidance based on the evaluation of multiple environmental samples at various PFAS sites. Field sampling occurring during extreme weather (e.g., rainfall, snowfall, or extreme heat) should be conducted while wearing the appropriate clothing that will not pose a risk for cross-contamination but will also ensure the safety of the field personnel.

4.2.1 PFAS-Free Water

The term PFAS-free water is defined here as water that does not contain significant concentrations of any compound in a specific PFAS analyte list that is being analyzed at a project-defined level. The significant concentrations depend on project data quality objectives and could, for instance, be less than the laboratory reporting limit, <1/2 the limit of quantitation, or other defined criteria for the specific PFAS compound of interest (ITRC, 2017).

NOTE: The confirmation of PFAS-free water should always be performed prior to the commencement of work. Site or public water supplies have been identified in many instances to contain detectable levels of PFAS.

One important consideration for each project is to identify a PFAS-free water source to use for decontamination of sampling and drilling equipment when applicable. The decontamination of sampling tools or small equipment parts can be performed using laboratory-supplied verified PFAS-free water. Other water can only be used for decontamination purposes if it has been analyzed and shown to be PFAS-free as defined for the project.

4.2.2 Materials Screening

Materials screening should be performed during the Health and Safety Plan (HASP) and QAPP development or the planning phase of sampling programs. The screening should be performed on all of the items and materials that are expected to come into contact with the samples and defined as **Category 1**.

Material screening should include a review of Safety Data Sheets (SDSs; formerly Material SDS [MSDSs]). Make sure the review uses current SDSs, because the actual composition of a particular item or material may have changed over time without changing the actual item or material name. All products from the United States or abroad should be screened. Text fragments such as “perfluoro,” “fluoro,” or “fluorosurfactant” may identify the use of PFAS in specific items or materials.

NOTE: Manufacturers can change the chemical composition of any product. As a result, equipment blank samples should be collected for all materials that will come into direct contact with the sample media, regardless of what category they might be in, to confirm they are “PFAS-free”, i.e. will not contaminate samples at detectable levels. **There is no guarantee that materials in the ‘Allowable category will always be PFAS-free.**

Some countries have official national lists of industrial chemicals defined by regulations, such as:

- Toxic Substances Control Act (TSCA) in the United States.
- European List of Notified Chemical Substances (EINECS), as well as substances pre-registered under the Registration, Evaluation, Authorization, and restriction of Chemicals (REACH) in the European Union.
- Swedish Chemical Agency (KEMI) in Sweden.

● - Prohibited ■ - Allowable ▲ - Needs Screening

- Domestic Substances List (DSL) in Canada.
- Inventory of Existing New Chemical Substances Produced or Imported in China (IECSC)
- Existing and New Chemical Substances Inventory (ENCS) in Japan.
- Korea Existing Chemicals Inventory (KECI) in South Korea.
- New Zealand Inventory of Chemicals (NZIoC) in New Zealand.
- Philippine Inventory of Chemicals and Chemical Substances (PICCS) in the Philippines.

The information available on these lists includes the chemical names and various identity numbers, which is usually the Chemical Abstracts Service number (CAS Number) (KEMI, 2015). The lists may not contain a substantial amount of information because of laws in regards to proprietary information, which gives the suppliers the right to not name newly developed chemicals. The information is not always sufficient to identify if the items or materials contain PFAS, as many of the PFAS do not have an assigned CAS Number at this time (KEMI, 2015). The most recent summary conducted by the Organization for Economic Co-operation and Development (OECD) identified 4,730 PFAS-related CAS numbers (OECD, 2018).

Sometimes manufacturers provide information about their products online or upon request, which may indicate if PFAS were used in the manufacturing of a particular item or material.

4.2.3 Sampling Equipment

The actual list of PFAS-containing materials potentially encountered onsite will change based on the specific sampled media and site-specific sampling conditions. Do not use any equipment that contains any known fluoropolymers. Consider all of the following:

- Do not use polytetrafluoroethylene (PTFE) that includes the trademark Teflon® and Hostaflon®, which can be found in many items, including but not limited to the lining of some hoses and tubing, some wiring, certain kinds of gears, and some objects that require the sliding action of parts.
- Do not use Polyvinylidene fluoride (PVDF) that includes the trademark Kynar®, which can be found in many items, including but not limited to tubing, films/coatings on aluminum, galvanized or aluminized steel, wire insulators, and lithium-ion batteries.
- Do not use Polychlorotrifluoroethylene (PCTFE) that includes the trademark Neoflon®, which can be found in many items, including but not limited to valves, seals, gaskets, and food packaging.
- Do not use Ethylene-tetrafluoroethylene (ETFE) that includes the trademark Tefzel®, which can be found in many items, including but not limited to the wire and cable insulation and covers, films for roofing and siding, liners in pipes, and some cable tie wraps.
- Do not use Fluorinated ethylene propylene (FEP) that includes the trademarks Teflon® FEP and Hostaflon® FEP, and may also include Neoflon®, which can be found in many items, including but not limited to the wire and cable insulation and covers, pipe linings, and some labware.
- Do not use low-density polyethylene (LDPE) for any items that will come into direct contact with the sample media. LDPE can be found in many items, including but not limited to containers and bottles, plastic bags, and tubing.
    - **However**, LDPE may be used if an equipment blank has confirmed it to be PFAS-free. LDPE does not contain PFAS in the raw material but may contain PFAS cross-contamination from the manufacturing process.

● - Prohibited ■ - Allowable ▲ - Needs Screening

- ■ LDPE bags (e.g., Ziploc®) that do not come into direct contact with the sample media and do not introduce cross-contamination with samples may be used.
- ■ Use materials that are either made of high-density polyethylene (HDPE), polypropylene, silicone, or acetate.
- ■ Glass bottles or containers may be used if they are known to be PFAS-free, however, PFAS have been found to adsorb to glass, especially when the sample is in contact with the glass for a long period of time (e.g. being stored in a glass container). If the sample comes into direct contact with the glass for a short period of time (e.g. using a glass container to collect the sample, then transferring the sample to a non-glass sample bottle), the adsorption is minimal.
- ■ Powderless nitrile gloves (which can be found at some hardware and major retail outlets).
- ▲ Latex gloves should be screened before use.
- ▲ Some sampling guidance documents allow the use of aluminum foil provided the shiny side is placed away from the sample (e.g., fish tissue sampling guidance). As a precaution, MDEQ recommends that aluminum foil not is used unless equipment blank samples confirm it is PFAS-free.

4.2.4 Field Clothing and Personal Protective Equipment (PPE)

Any field planning and mobilization effort should address the physical, chemical, and biological hazards associated with each PFAS site. The mitigation of potential risks may be documented in a site-specific HASP or a QAPP. Due to the extensive use of PFAS in many industries and products, PPE may contain PFAS. During PFAS investigation, PPE containing PFAS should be avoided to prevent cross-contamination. The development of the HASP or QAPP should consider these factors before mobilization in the field. All HASPs or QAPPs need to address the concern of potential exposure of staff to PFAS through PPE.

Personal safety is paramount. The safety of staff should not be compromised by fear of PFAS containing materials without any scientific basis. Any deviation from this guidance, including those necessary to ensure the health and safety of sampling personnel, must be recorded in field notes and discussed in the final report.

Globally, protective coatings for textiles are estimated to be about 50 percent of the total use of PFAS (DEPA, 2015). Due to its unique properties of water and oil repellency, PFAS has been used to coat various clothing (i.e., pants, jackets, and t-shirts) and leather products (i.e., boots, shoes, and jackets). Many of these types of clothing and PPE have the potential to be used in the sampling environment.

NOTE: The Danish Ministry of the Environment identified alternative polymer technology as being PFAS-free. Products treated with this technology are water- resistant, but not oil and dirt repellent to the same extent as products treated with PFAS- based agents (DEPA, 2015).

While preparing for sampling, particular focus should be made on clothing that has been advertised as having waterproof, water-repellant, or dirt and/or stain resistant characteristics. These types of clothing are most likely to have had PFAS used in their manufacturing.

Field Clothing and PPE that should be avoided (●) in the immediate sampling environment include the following:

- ● Do not use clothing that has been washed with fabric softener which may contain PFAS.
- ● Do not use clothing that has been made with or washed with water, dirt, and/or stain resistant chemicals.
- ● Do not use clothing chemically treated for insect resistance and ultraviolet protection (See **Section 4.2.5** on biological hazards).
- ● Do not use clothing or PPE items that have any of the brand or product names that have been found to contain PFAS by the Danish Ministry of the Environment and presented in **Table 1** below (DEPA, 2015).

Field Clothing and PPE that are allowable (■) to wear within the immediate sampling environment include the following:

- ■ Powderless nitrile gloves.
- ■ Polyvinyl chloride (PVC) or wax-coated fabrics.
- ■ Neoprene.
- ■ Any boots made of polyurethane and/or PVC. If the HASP requires a specific type of boot such as (steel-toed), and PFAS-free cannot be purchased, PFAS- free over-boots may be worn. The overboots must be put on, and hands washed after putting the overboots on before the beginning of sampling activities. Overboots may only be removed in the staging area and after the sampling activities have been completed.
- ■ Synthetic and natural fibers (preferably cotton) that are well laundered (more than six times with no fabric softener) clothes and cotton overalls.

NOTE: There could be many PPE materials used during various sampling events, including hard hats and safety glasses. All clothing and PPE should be evaluated prior to sampling.

Field Clothing and PPE that must be evaluated (▲) before wearing within the immediate sampling environment include the following:

- ▲ Latex gloves.
- ▲ Water resistant or stain-treated clothing and PPE.
- ▲ Tyvek suits and clothing that contain Tyvek® (USEPA PFAS sampling guidance from USEPA Region 2 prohibits the use of Tyvek; available product information suggests Tyvek® may be used if required. Coated Tyvek® requires further evaluation; therefore, MDEQ recommends the collection of an Equipment Blank before Tyvek® use).

● - Prohibited ■ - Allowable ▲ - Needs Screening

Table 1 below provides a list of prohibited field clothing (DEPA, 2015). However, the manufacturer and/or vendor for the field clothing and/or PPE should be contacted to confirm that these brand or product names still contain PFAS. There have been instances where manufacturers have kept the same brand and/or product name but have changed the chemicals used during the manufacturing of a particular item.

Table 1. Prohibited Field Clothing and PPE Brand and Product Names

● Prohibited Materials[1] (DEPA, 2015)	
Advanced Dual Action Teflon® fabric protector.	Release Teflon®
Repel Teflon® fabric protector	High-Performance Release Teflon®
High performance Repel Teflon® fabric protector	Ultra Release Teflon®
NK Guard S series	GreenShield®
Tri-Effects Teflon® fabric protector	Lurotex Protector RL ECO®
Oleophobol CP®	Repellan KFC®
Rucostar® EEE6	UnidyneTM
Bionic Finish®	RUCO-GUARD®
RUCOSTAR®	RUCO-COAT®
RUCO-PROTECT®	RUCOTEC®
RUCO®	Resist Spills™
Resists Spills and Releases Stains™	Scotchgard™ Fabric Protector

[1]This list is not considered to be a complete listing of prohibited materials. All materials should be evaluated before use during sampling.

4.2.5 Sun and Biological Protection

Because biological hazards (sunburn, mosquitos, ticks, etc.) may be encountered during sampling, the elimination of specific clothing materials or PPE (sunscreens and insect repellants) could pose a health and safety hazard to staff.

The safety of staff should not be compromised by fear of PFAS containing materials without any scientific basis. Personal safety is paramount. Any deviation from this guidance, including those necessary to ensure the health and safety of MDEQ staff, should be recorded in field notes and discussed in the final report.

Prolonged sun exposure will require sunscreens, which may have included PFAS in their manufacture. Protection against insects may require the use of insect repellant. **Table 2** contains a detailed list of sunscreens and insect repellants that have been analyzed and found to be PFAS-free as of the date of this document. Note that this is not a comprehensive list of allowable insect repellants or sunscreens; other products may meet the requirements for use. Listing or omission of any product does not imply endorsement or disapproval. Also, there is no guarantee that these products will always remain PFAS free.

NOTE: Sunscreens and insect repellants must be evaluated on a case-by-case basis. Refer to **Section 4.6 Quality Control Samples** for details on collecting equipment blanks.

The MDEQ recommends that additional sunscreens and insect repellents be treated as (▲) Needs Screening and should be evaluated before use.

- ● Sunscreens and insect repellants should not be applied near the sample collection area.
- ■ Hands should be well washed after application or handling of these products, and afterwards, powderless nitrile gloves should be worn.

● - Prohibited ■ - Allowable ▲ - Needs Screening

Table 2. Sunscreen and Insect Repellents[1]

■ Allowable Insect Repellants	
Photos	**Insect Repellent Spray**
	• OFF Deep Woods • Sawyer Permethrin

■ Allowable Sunscreens	
Photos	**Sunscreens**
	• Banana Boat Sport Performance Sunscreen Lotion Broad Spectrum SPF 30. • Meijer Sunscreen Lotion Broad Spectrum SPF 30. • Neutrogena Ultra-Sheer Dry-Touch Sunscreen Broad Spectrum SPF 30.

■ Allowable Sunscreens
• Banana Boat for Men Triple Defense Continuous Spray Sunscreen SPF 30
• Banana Boat Sport Performance Coolzone Broad Spectrum SPF 30
• Banana Boat Sport Performance Sunscreen Lotion Broad Spectrum SPF 30
• Banana Boat Sport Performance Sunscreen Stick SPF 50
• Coppertone Sunscreen Lotion Ultra Guard Broad Spectrum SPF 50
• Coppertone Sport High-Performance AccuSpray Sunscreen SPF 30
• Coppertone Sunscreen Stick Kids SPF 55
• L'Oréal Silky Sheer Face Lotion 50+
• Meijer Clear Zinc Sunscreen Lotion Broad Spectrum SPF 15, 30 and 50
• Meijer Wet Skin Kids Sunscreen Continuous Spray Broad Spectrum SPF 70
• Neutrogena Beach Defense Water + Sun Barrier Lotion SPF 70
• Neutrogena Beach Defense Water + Sun Barrier Spray Broad Spectrum SPF 30
• Neutrogena Pure & Free Baby Sunscreen Broad Spectrum SPF 60+
▲ Materials That Require Screening
Sunscreens: Alba Organics Natural Sunscreen, Yes To Cucumbers, Aubrey Organics, Jason Natural Sun Block, Kiss My Face, and baby sunscreens that are "free" or "natural."
Insect Repellents: Jason Natural Quit Bugging Me, Repel Lemon Eucalyptus Insect repellant, Herbal Armor, California Baby Natural Bug Spray, Baby Ganics.
Sunscreen and Insect Repellent: Avon Skin So Soft Bug Guard Plus – SPF 30 Lotion.

[1]This table is not considered to be a complete listing of allowable materials and materials that require screening. All materials should be evaluated before use during sampling. Some of the sunscreen and insect repellent testing has been performed using a PFAS screening Method known as Particle Induce Gamma-Ray Emission (PIGE). The use of approved gloves should always be used, and the sample should never come into contact with any of the sunscreen or insect repellent products. An Equipment Blank sample could also be collected to verify the product as PFAS-free.

● - Prohibited ■ - Allowable ▲ - Needs Screening

If an insect repellant has not been approved and staff needs protection against biting insects:

NOTE: The words "Natural" and/or "Organic" in the product name or to describe it does not mean that it is PFAS-free.

- Tuck pant legs into socks and/or boots to seal the gap between the boots and the pants to reduce the risk of being bitten by ticks.
- Wear well-washed, light-colored clothing to easily see ticks during field activities.
- Light-colored clothing, long sleeves, and large-brimmed hats also prevent sunburn.
- Equipment Blank samples should be collected to verify that the preferred insect repellant or sunscreen is PFAS-free by using the testing procedures identified in **Section 4.6 Quality Control Samples**.

4.2.6 Personnel Hygiene and Personal Care Products (PCPs)

A number of sampling guidance documents recommend that personal hygiene and personal care products (PCPs) (e.g., cosmetics, shampoo, sunscreens, dental floss, etc.) not be used prior to and on the day(s) of sampling because the presence of PFAS in these products has been documented (OECD, 2002, Fujii, 2013, Borg and Ivarsson, 2017). However, if the MDEQ's sampling SOPs are followed, these items should not come into contact with the sampling equipment or the sample being collected. As of the date of this sampling guidance, cross-contamination of samples due to the use of PCPs has not been documented during the collection of thousands of samples. However, field personnel should be aware of the potential of cross-contamination if the sampling equipment or actual samples would come into contact with these products. The following precautions should be taken when dealing with personal hygiene or PCPs before sampling:

- ● Do not handle or apply PCPs in the sampling area.
- ● Do not handle or apply PCPs while wearing PPE that will be present during sampling.
- ■ Move to the staging area and remove PPE if applying personal care products becomes necessary.
- ■ Wash hands thoroughly after the handling or application of PCPs and, when finished, put on a fresh pair of powderless nitrile gloves.

4.2.7 Food Packaging

PFAS has been used by the paper industry as a special protective coating against grease, oil, and water for paper and paperboards, including food packaging since the late 1950s (Trier et al., 2018). PFAS application for food packaging includes paper products that come into contact with food such as paper plates, food containers, bags, and wraps (OECD, 2002). In January 2016, the Food and Drug Administration (FDA) banned the use of PFAS which has eight carbon atoms (such as PFOA and PFOS) or more, in food packaging materials. However, PFOA and PFOS or other eight or more carbon chain PFAS may still be detected in food packaging because of the use of recycled paper which may contain PFAS. Various studies have found up to 57percent detection frequency in food contact materials such as paper (Trier et al., 2011; Rosenmai et al., 2013; Schaider et al., 2017).

NOTE: Short-chain PFAS have not been banned for use in the manufacturing of contact food materials in the United States.

PFAS has been used by the paper industry as a special protective coating against grease, oil, and water for paper and paperboards, including food packaging since the late 1950s (Trier et al., 2018). PFAS application for food packaging includes paper products that come into contact with food such as paper plates, food containers, bags, and wraps (OECD, 2002). Pre-wrapped food or snacks (such as candy bars, microwave popcorn, etc.) must not be in the sampling and staging areas during sampling due to PFAS contamination of the packaging. When staff

requires a break to eat or drink, they should remove their gloves, coveralls, and any other PPE, if worn, in the staging area and move to the designated area for food and beverage consumption. When finished, staff should wash their hands and put on a fresh pair of powderless nitrile gloves at the staging area, before returning to the sampling area.

- ● Do not handle, consume, or otherwise interact with pre-wrapped food or snacks, carry-out food, fast food, or other food items while on-site during sampling.
- ■ Move to the staging area and remove PPE prior to leaving the sampling and staging areas if consuming food on site becomes necessary.

4.3 PFAS Sampling Procedures

4.3.1 Sample Containers, Handling, and Collection

All bottles used for PFAS sampling should come from the laboratory that will also be performing the PFAS analysis. Commercial laboratories that have demonstrated awareness and elimination of possible PFAS cross-contamination from sample containers and laboratory supplies should be used. Recommended sampling containers will be discussed for each environmental media. Any sampling containers provided by the laboratory should be verified as PFAS-free.

Before sampling, staff may come into contact with textiles and fabrics treated with PFAS, such as carpets and car interiors. Staff should be aware that these materials, and any other surfaces that repel water and are stain resistant, have the potential of being treated with PFAS. However, these are considered **Category 2** materials and the field personnel should be aware of the possible PFAS use. Sample containers and equipment that will be used for sampling should not be stored on or come into contact with materials suspected to contain PFAS.

For all environmental media, hands should be well washed before sampling. Clean powderless nitrile gloves must be put on before sample collection, handling of sample containers, and handling sampling equipment. The sample container must be kept sealed at all times and only open during the sample collection. The sampling container cap or lid should never be placed on any surface unless it is PFAS-free. The sampling container cap or lid must never be placed directly on the ground. A list of various materials used in sampling and handling can be found in the **MDEQ Quick Reference Field Guide** located at the end of this document.

In the absence of formal USEPA guidance for PFAS sample storage, the documentation in EPA Method 537 Rev. 1.1 should be used as a guide for thermal preservation (holding temperature), and holding times for other environmental media samples (with the exception of biota – in order to limit microbial growth, biota samples such as fish and vegetation are recommended to be kept frozen until the sample is prepared).

If published analytical reference methods, other than EPA Method 537 Rev. 1.1 are used, follow the guidelines or requirements in those methods for sample storage, preservation, and hold times. Otherwise EPA Method 537 Rev. 1.1 requries that samples must be chilled during storage and shipment, and must not exceed 50°F (10°C) during the first 48 hours after collection.

4.3.2 Sample Shipment

In general, for all environmental media sampled for PFAS, samples must be kept on ice from the time of sample collection to the arrival at the laboratory. The following procedures should be used for sample shipment:

● - Prohibited ■ - Allowable ▲ - Needs Screening

- Regular ice should be used to cool and maintain the sample at or below the proper temperature.
  - ▲ Chemical or blue ice may be used if it is known to be PFAS-free and it is absolutely certain that the sample is cooled and maintained at or below the proper temperature during collection and through transit to the laboratory.
- Refresh with regular ice, if needed, double bagged in LDPE resealable storage bags if needed.
- Fish and other wildlife samples should be placed on dry ice and frozen before the shipment to the lab. If fish is frozen, shipping the samples overnight on ice should be acceptable.
- The samples, ice, and chain of custody (COC) should always be bagged in polyethylene (i.e., Ziploc®) bags.
- Chain of Custody and other forms should be single bagged in LDPE resealable storage bags and taped to the inside of the cooler lid.
- The cooler should be taped closed with a custody seal and shipped by overnight courier.
- Samples should be shipped as soon as possible (e.g. overnight) to ensure the samples arrive within the analytical holding time specified by the lab.

4.3.3 Preferential Sampling Sequence

A preferred sampling sequence should be established before any sampling event to reduce the risk of cross-contamination. In general, the sampling sequence should be such that sampling starts in areas where it is expected or known to be least contaminated, to areas anticipated or identified to be most contaminated. If analytical results from past sampling events are available, the sampling sequence can be readily determined.

For many PFAS investigation sites, no PFAS sampling has been conducted. In these cases, all site information on possible PFAS uses and potential PFAS migration patterns (e.g., upgradient, downgradient) from PFAS sources at the site should be reviewed before the sampling event to help establish the sampling sequence.

If multiple samples (i.e., monitoring wells) will be collected for an area where a particular or potential PFAS release in the environment might have been documented, samples that are known to be upgradient from the impacted area should be sampled first, followed by those that are furthest downgradient from the suspected source. The remaining wells should be progressively sampled from the most distant downgradient to those closer to the known PFAS source.

If no information is available about the site, samples are to be collected in the following order:

1) drinking water (e.g., residential wells).
2) surface water.
3) groundwater.

4.4 Decontamination Procedures

It is customary with sampling that equipment is decontaminated at the conclusion of the sampling event. If the previous user of the equipment is not known, and it is unclear how the equipment was handled, especially rental equipment, the equipment should be decontaminated.

Disposable **Category 1** sampling equipment should be used, especially for sample bottles and other materials that are used where the sample may be in contact with the sampling equipment for an extended time period.

● - Prohibited ■ - Allowable ▲ - Needs Screening

Non-disposable sampling equipment used at multiple sites or sampling locations can become highly contaminated with PFAS. Decontamination procedures must be implemented to prevent cross-contamination, especially between individual sample locations. It is customary to decontaminate sampling equipment at the end of the sampling event, whether the event is a single sampling location or several sites that conclude at the end of the workday.

Throughout the sampling guidance documents, information will be provided about any media-specific decontamination procedures. For non-dedicated **Category 1** sampling equipment, there are many decontamination methods, two of which are listed below.

Decontamination Method 1:

- ● Do not use Decon 90®.
- ● Do not put equipment away without decontaminating it.
- ■ Laboratory supplied PFAS-free deionized water is preferred for decontamination.
- ■ Alconox®, Liquinox®, and Citranox® can be used for equipment decontamination.
- ■ Sampling equipment can be scrubbed using polyethylene or polyvinylchloride (PVC) brush to remove particulates.
- ■ Decontamination procedures should include triple rinsing with PFAS-free water.
- ■ Do decontaminate sampling equipment after sampling at each location, or at the end of the workday.
- ■ Commercially available deionized water in an HDPE container may be used for decontamination if the water is verified to be PFAS-free as defined in **Section 4.2.1** of this document.
- ▲ Municipal drinking water may be used for decontamination purposes if it is known to be PFAS-free.

Decontamination Method 2:

1. In a PFAS-free bucket, wash the equipment with a mixture of PFAS-free water and PFAS-free soap (bucket #1)
2. In a second PFAS-free bucket (bucket #2), rinse the equipment with PFAS-free water
3. A second rinse should be done with PFAS-free water using either a third bucket (bucket #3) or, if washed and rinsed, the second bucket (bucket #2).
4. For decontamination of additional equipment, change the decontamination water between cleanings.

4.5 Laboratory Considerations

The PFAS analytical list is available on the MPART website (www.michigan.gov/PFASresponse) under Testing and Treatment. This list includes the 14 analytes required to be analyzed for drinking water samples when using USEPA Method 537 Rev. 1.1, and the 24 analytes the MDEQ recommends be analyzed for all other environmental media. The MPART website should be visited to download the most recent document. Laboratories should be able to analyze and report PFAS results that will meet the project-specific data quality objectives identified in the QAPP.

Drinking Water Samples

USEPA Method 537 Revision 1.1 must be used for testing finished drinking water samples. Other methods are available for non-drinking water samples. Many laboratories refer to the isotope dilution method as 'modified Method 537,' however, the USEPA does not recognize isotope dilution as an acceptable modification of USEPA Method 537 Rev. 1.1 for drinking water analysis. USEPA drinking water methods are generally prescriptive, and only limited modifications are allowed because the finished treated drinking water is assumed to be free of significant interferences.

NOTE: USEPA Method 537 Rev. 1.1 was developed to be used only for finished drinking water samples, and contains specific requirements for sample preservation, shipping storage, and holding times.

USEPA Method 537 Rev. 1.1 was designed for finished drinking water and chemical preservation using Trizma® to buffer the sample and remove free chlorine. Non-chlorinated finished drinking water may also be analyzed using USEPA Method 537 Rev. 1.1.

Other Environmental Media Samples

There are currently no published USEPA methods using isotope dilution for determining PFAS in non-drinking water matrices or other sample media. There are USEPA methods for analyzing PFAS in additional matrices going through the development and validation process and may be available as early as fall of 2018. Some commercial laboratories have developed isotope dilution methods based on existing published methods, however, there may be significant differences between SOPs from different commercial laboratories regarding the details of the preparation and analysis of PFAS samples. A review of the laboratory's procedure and certifications should be done to ensure that the laboratory is capable of providing data that meet the data quality objectives of the project. MDEQ is implementing a laboratory SOP review process. Staff should refer to the MDEQ internal shared drive to see whether SOPs have been reviewed for the lab they are considering.

The following non-USEPA analytical methods have been published for use in determining PFAS in various media:

- ISO (International Organization for Standardization) Method 25101 (ISO, 2009) - Water quality Determination of PFOA and PFOS - Method for unfiltered samples of drinking water, groundwater, and surface water, using solid phase extraction and liquid chromatography/mass spectrometry (HPLC/MS/MS.)

- ASTM D7979 (ASTM, 2017) - Standard Test Method for Determination of Per- and Polyfluoroalkyl Substances in Water, Sludge, Influent, Effluent and Wastewater by Liquid Chromatography-Tandem Mass Spectrometry (LC/MS/MS). This method has been investigated for use with surface water, sludge, and wastewater for selected PFAS. This method has not been evaluated on drinking water matrices. Some commercial laboratories have modified this method and are using isotope dilution.

- ASTM D7968 (ASTM, 2017) - Standard Test Method for Determination of Polyfluorinated Compounds in Soil by Liquid Chromatography-Tandem Mass Spectrometry (LC/MS/MS). This procedure utilizes a quick extraction and is not intended to generate an exhaustive accounting of the content of PFAS in difficult soil matrices.

4.6 Quality Control Samples

4.6.1 Laboratory Quality Control Samples

The QAPP should describe what batch quality control (QC) samples – such as method blank (MB), laboratory control sample (LCS), laboratory control sample duplicate (LCSD), field duplicate (FD), matrix spike (MS), and matrix spike duplicate (MSD) – are prepared for each media type. In some cases, depending on the project, additional QC samples may be required. For samples with high concentrations of PFAS, an FD may be warranted. The QAPP should also reference the laboratory SOP.

4.6.2 Field Quality Control Samples

Field QC samples can be used to evaluate the field equipment and supplies as well as assess the possibility of cross-contamination during sampling, transport, and storage of samples. For samples such as equipment rinse blanks (EB), field blanks (FB), and trip blanks (TB) the following is required:

- EB should be collected by passing laboratory verified PFAS-free water over or through decontaminated field sampling equipment before the collection of samples to assess the adequacy of the decontamination process and/or to evaluate potential contamination from the equipment used during sampling. The recommended frequency should be in the QAPP.

- FB are prepared in the laboratory by placing an aliquot of PFAS-free water reagent water in a sample container and treating it as a sample in all respects, including shipment to the sampling site, exposure to sampling site conditions, storage, preservation, and all analytical procedures. The purpose of the FB is to determine if method analytes or other interferences are present in the field environment. The recommended frequency should be in the QAPP.

- TB are a bottle of PFAS-free water that should be prepared in the laboratory, should then travel from the laboratory to the site, and then get transported back to the laboratory without having been exposed to any sampling procedures. Typically, a TB is used for volatile compounds, but it may be recommended for PFAS sampling to assess cross-contamination introduced from the laboratory and during shipping procedures. The recommended frequency should be in the QAPP

5. References

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Michigan Department of Environmental Quality

MDEQ PFAS Sampling Quick Reference Field Guide[1]

All Items Used During Sampling Event

● Prohibited

• Items or materials that contain fluoropolymers such as
  ○ Polytetrafluoroethylene (PTFE), that includes the trademarks Teflon® and Hostaflon®
  ○ Polyvinylidene fluoride (PVDF), that includes the trademark Kynar®
  ○ Polycholotrifluoroethylene (PCTFE), that includes the trademark Neoflon ®
  ○ Ethylene-tetrafluoro-ethylene (ETFE), that includes the trademark Tefzel®
  ○ Fluorinated ethylene propylene (FEP), that includes the trademarks Teflon® FEP and Hostaflon® FEP
• Items or materials that contain any other fluoropolymer

Pumps, Tubing, and Sampling Equipment

● Prohibited	■ Allowable	▲Needs Screening[2]

• Items or materials containing any fluoropolymer (potential items include tubing, valves, or pipe thread seal tape)	• High-density polyethylene (HDPE)
	• Low-density polyethylene (LDPE) tubing
	• Polypropylene
	• Silicone
	• Stainless-steel
	• Any items used to secure sampling bottles made from:
	  ○ Natural rubber
	  ○ Nylon (cable ties)
	  ○ Uncoated metal springs
	  ○ Polyethylene
		• Any items or materials that will come into direct contact with the sample that have **not** been verified to be PFAS-free
		  ○ Do not assume that any sampling items or materials are PFAS-free based on composition alone

Sample Storage and Preservation

● Prohibited	■ Allowable	▲Needs Screening[2]
• Polytetrafluoroethylene (PTFE): Teflon® lined bottles or caps	• Glass jars[4] • Laboratory-provided PFAS-Free bottles: ○ HDPE or polypropylene • Regular wet ice • Thin HDPE sheeting • LDPE resealable storage bags (i.e. Ziploc®) that will not contact the sample media[6]	• Aluminium foil[4] • Chemical or blue ice[5] • Plastic storage bags other than those listed as ■ Allowable • Low-density polyethylene (LDPE) bottles

Field Documentation

● Prohibited	■ Allowable	▲Needs Screening[2]
• Clipboards coated with PFAS • Notebooks made with PFAS treated paper • PFAS treated loose paper • PFAS treated adhesive paper products	• Loose paper (non-waterproof, non-recycled) • Rite in the Rain® notebooks • Aluminium, polypropylene, or Masonite field clipboards • Ballpoint pens, pencils, and Fine or Ultra-Fine Point Sharpie® markers	• Plastic clipboards, binders, or spiral hard cover notebooks • All markers not listed as ■ Allowable • Post-It® Notes or other adhesive paper products • Waterproof field books

Decontamination

● Prohibited	■ Allowable	▲Needs Screening[2]
• Decon 90® • PFAS treated paper towel	• Alconox®, Liquinox®, or Citranox® • Triple rinse with PFAS-free deionized water • Cotton cloth or untreated paper towel	• Municipal water • Recycled paper towels or chemically treated paper towels

Clothing, Boots, Rain Gear, and PPE

● Prohibited	■ Allowable	▲Needs Screening[2]
• New or unwashed clothing • Anything made of or with: ○ Gore-Tex™ or other water-resistant synthetics • Anything applied with or recently washed with: ○ Fabric softeners ○ Fabric protectors, including UV protection ○ Insect resistant chemicals ○ Water, dirt, and/or stain resistant chemicals	• Powderless nitrile gloves • Well-laundered synthetic or 100% cotton clothing, with most recent launderings not using fabric softeners • Made of or with: ○ Polyurethane ○ Polyvinyl chloride (PVC) ○ Wax coated fabrics ○ Rubber / Neoprene ○ Uncoated Tyvek®	• Latex gloves • Water and/or dirt resistant leather gloves • Any special gloves required by a HASP • Tyvek® suits, clothing that contains Tyvek®, or coated Tyvek®

Food and Beverages

● Prohibited	■ Allowable
• No food should be consumed in the staging or sampling areas, including pre-packaged food or snacks. ■ If consuming food on-site becomes necessary, move to the staging area and remove PPE. After eating, wash hands thoroughly and put on new PPE.	• Brought and consumed only outside the vicinity of the sampling area: ○ Bottled water ○ Hydration drinks (i.e. Gatorade®, Powerade®)

Personal Care Products (PCPs) - for day of sample collection[6]

● Prohibited	■ Allowable	▲Needs Screening[2]
• Any PCPs[6], sunscreen, and insect repellent applied in the sampling area.	PCPs[6], sunscreens, and insect repellents applied in the staging area, away from sampling bottles and equipment followed by thoroughly washing hands: **PCPs[6]:** • Cosmetics, deodorants/antiperspirants, moisturizers, hand creams, and other PCPs[6] **Sunscreens:** • Banana Boat® for Men Triple Defense Continuous Spray Sunscreen SPF 30 • Banana Boat® Sport Performance Coolzone Broad Spectrum SPF 30 • Banana Boat® Sport Performance Sunscreen Lotion Broad Spectrum SPF 30 • Banana Boat® Sport Performance Sunscreen Stick SPF 50 • Coppertone® Sunscreen Lotion Ultra Guard Broad Spectrum SPF 50 • Coppertone® Sport High Performance AccuSpray Sunscreen SPF 30 • Coppertone® Sunscreen Stick Kids SPF 55 • L'Oréal® Silky Sheer Face Lotion 50 • Meijer® Clear Zinc Sunscreen Lotion Broad Spectrum SPF 50 • Meijer® Sunscreen Continuous Spray Broad Spectrum SPF 30 • Meijer® Clear Zinc Sunscreen Lotion Broad Spectrum SPF 15, 30 and 50 • Meijer® Wet Skin Kids Sunscreen Continuous Spray Broad Spectrum SPF 70 • Neutrogena® Beach Defense Water+Sun Barrier Lotion SPF 70 • Neutrogena® Beach Defense Water+Sun Barrier Spray Broad Spectrum SPF 30 • Neutrogena® Pure & Free Baby Sunscreen Broad Spectrum SPF 60+ • Neutrogena® UltraSheer Dry-Touch Sunscreen Broad Spectrum SPF 30 **Insect Repellents:** • OFF® Deep Woods • Sawyer® Permethrin	• Products other than those listed as ■Allowable

[1] This table is not considered to be a complete listing of prohibited or allowable materials. All materials should be evaluated prior to use during sampling. The manufacturers of various products should be contacted in order to determine if PFAS was used in the production of any particular product.

[2] Equipment blank samples should be taken to verify these products are PFAS-free prior to use during sampling.

[3] **For surface water foam samples:** LDPE storage bags may be used in the sampling of foam on surface waters. In this instance, it is allowable for the LDPE bag to come into direct contact with the sample media.

[4] **For fish and other wildlife samples:** Depending on the project objectives, glass jars and aluminum foil might be used for PFAS sampling. PFAS has been found to bind to glass and if the sample is stored in a glass jar, a rinse of the jar is required during the sample analysis. PFAS are sometimes used as a protective layer for some aluminum foils. An equipment blank sample should be collected prior to any aluminum foil use.

[5] Regular ice is recommended as there are concerns that chemical and blue ice may not cool and maintain the sample at or below 42.8°F (6°C) (as determined by EPA 40 CFR 136 – NPDES) during collection and through transit to the laboratory.

[6] Based on evidence, avoidance of PCPs is considered to be precautionary because none have been documented as having cross-contaminated samples due to their use. However, if used, application of PCPs must be done at the staging area and away from sampling bottles and equipment, and hands must be thoroughly washed after the use of any PCPs prior to sampling.

●- Prohibited ■- Allowable ▲- Needs Screening

Michigan PFAS Action Response Team
Continuity of Operations Plan for Residential Well Sampling
Addendum, Dated October 26, 2020

Purpose of Addendum

The purpose of this addendum to the *Michigan PFAS Action Response Team Continuity of Operations Plan for Residential Well Sampling* is to update guidance for residential well sampling operations so as not to conflict with any State and local mandates, including but not limited to the current Michigan Department of Health and Human Services' Epidemic Order (Gathering Prohibition and Face Covering Order), Michigan Department of Labor and Economic Opportunity (LEO) and Michigan Occupational Safety and Health Administration's (MIOSHA) Emergency Rules 10-14-20 (Coronavirus Disease 2019), and Executive Directive 2020-08. As State and local mandates are updated, MPART will continue to operate in a manner compliant with such doctrine. Additionally, this addendum was written to incorporate updated advice from the Centers for Disease Control and Prevention, and to support MPART's obligation to identify and reduce exposures to PFAS contamination in private well water and other contaminant pathways. This is the best guidance at the point-in-time issued. MPART will continue to evaluate this guidance to ensure it remains consistent with all relevant mandates and health recommendations as Michigan continues efforts to slow the spread of COVID-19.

Residential Well Sampling Protocol

The following protocol for reducing risk when sampling a residential well is mostly unchanged from the original *MPART Continuity of Operations Plan for Residential Well Sampling*. At the time of the residential sampling visit, whether indoors or outdoors, the following protocol should be followed by MPART staff:

- Prior to commencing field work for the day, complete a self-health assessment by taking your temperature and asking yourself the following three questions. If you have a temperature of 100.4 degrees or higher—or answer "yes" to any of the three questions—you may not conduct field work that day. Results of this self-health assessment must be documented.

    - ✓ Are you currently under evaluation for COVID-19 or have you been instructed to self-quarantine or isolate?

    - ✓ Have you had contact with any Persons Under Investigation for COVID-19 within the last 14 days, OR with anyone known to have COVID-19?

    - ✓ Do you have any symptoms of a respiratory infection (e.g., new cough, sore throat, fever, unexplained shortness of breath, difficulty breathing or sudden loss of taste or smell) or gastrointestinal illness (e.g., nausea, vomiting, diarrhea)?

- Prior to the resident opening the door, or at a minimum distance of six feet from the resident, the resident should be asked the above three health screening questions pertaining to all members of their household. If the resident can answer "no" to all three questions, and you continue to attest to "no" to all three questions, it is allowable for the residential sampling to occur.

- If the resident cannot answer "no" to all three health screening questions pertaining to all members of their household, an in-home sampling may not occur. However, sampling from a spigot located outside of the residence may proceed if: 1) the resident agrees, and 2) the sampling team is comfortable and able to avoid contact with anyone who responded yes to any of the screening questions.
- During the visit, all MPART staff must wear a fabric or disposable mask over mouth and nose, new disposable gloves and, if sampling indoors, new shoe covers. Mask should be put on before leaving your vehicle, and not removed until you are back in your vehicle.
- Refrain from touching your face.
- Using an appropriate disinfectant, ensure all equipment is cleaned thoroughly before and after each visit, including testing equipment, coolers and/or sampling buckets, administrative tools, laptops, cellular phones, mobile devices, and other items.
- Clean surfaces that you plan to touch or have touched with a disinfecting wipe.
- Wash hands for at least 20 seconds with soap and warm water before and after each visit. If this is not feasible, take hand sanitizer containing at least 60% ethanol or 70% isopropanol with you and use it in lieu of aforementioned handwashing.
- After the visit, dispose of all waste items (disposable mask, gloves, booties, and disinfecting wipes) in a double-lined plastic bag. Final disposal of this waste will be in an appropriate solid waste receptacle.
- Maintain 'social distance' (6 feet) from those you visit.
- Avoid typical handshakes and other welcome and goodbye behavior which require person to person contact.
- If you must cough or sneeze, do not remove your mask to do so. Without removing your mask, cough, or sneeze into your upper sleeve.
- Immediately report back to your manager if you feel there has been an exposure.

If, at any point before or during the on-site or in-home visit, the resident or the field staff feels the visit should be terminated based on COVID-19 concerns, the field staff shall leave the premises and document the issue in the field notes.

Implementation of MIOSHA Emergency Rules 10-14-20 (COVID-19)

MIOSHA Emergency Rules 10-14-20 allow for in-home services given precautions are taken to reduce the spread of COVID-19. Such precautions prescribed by the MIOSHA Emergency Rules 10-14-20 and followed by MPART include:

- Daily health screening of all staff performing in-home or on-site visits prior to arriving at the job site.
- Asking the resident health screening questions at the time of scheduling, and/or at the time of the home visit. If anyone inside of the home does not pass the screening, an in-

home visit must be rescheduled.

- Maintain accurate appointment record, including date and time of service, name of client, and contact information, to aid in contact tracing.

In addition to the precautions prescribed by MIOSHA Emergency Rules 10-14-20, MPART will take other precautions as described herein.

- **Location of Water Sampling:** As previously mandated, sampling will be preferentially done at an outside spigot to remove the need for an MPART employee to enter a place of residence. If this is not feasible, or if it is desirable that the sample be collected from the drinking water tap or other interior plumbing locations, the MPART employee may enter a place of residence while strictly adhering to all COVID-19 precautions listed at the beginning of this addendum.

- **Scheduling of Sampling:** In order to reduce the inherent risk of a home visit, attempts will be made to preschedule all sampling. The first, and most protective, method used will be scheduling the home visit over the phone, at which time the health screening questions may be asked of the resident. Additionally, the purpose of the sampling and request to sample will be explained as directed in the current *MPART Continuity of Operations Plan for Residential Well Sampling* dated May 21, 2020. If there is no phone contact information for an individual, or if an individual was not able to be reached via phone after a reasonable number of attempts, a door hanger may be used at the place of residence. This door hanger should instruct the resident to call an MPART agent or contractor for scheduling an at-home visit.

- **Impromptu Home Visits:** If an individual cannot be reached by phone or the use of door hangers, impromptu door knocking to request sampling is allowed. If door knocking is used, the MPART staff conducting the door knocking must wear a mask at all times and retreat to at least six feet of distance after knocking. At this point, the purpose of the sampling and request to sample will be explained as directed in the current *MPART Continuity of Operations Plan for Residential Well Sampling*. If the resident agrees to the sampling of their well, the MPART staff will ask the COVID-19 health screening questions of the resident, attest to their own health through the completion of the same set of questions, and explain all COVID-19 precautions they will be taking during the sampling. If the resident passes the health screening, the sampling may continue.

The guidance provided herein, dated October 26, 2020, will remain in effect and paramount until the threat of COVID-19 transmission has been moderated.

Required Training

State employees must complete the training module **COVID-19: Keeping You Safe at Work**, in the State of Michigan Learning Center

https://stateofmichiganlearningcenter.csod.com/client/stateofmichiganlearningcenter/default.aspx

BID ADDENDUM #1 & RESPONSE TO QUESTIONS
Bid Package #2022-01 - Grayling Home Water Sampling and Filter Replacements

ADDENDUM:

1. Revised Bid Sheet – attached. For bidding purposes assume a maximum of 20 filters to be sampled quarterly. Line Item homeowner no show has been added if the homeowner has an appointment scheduled and doesn't show up.

QUESTIONS:

The following questions were received within the allotted timeframe. Answers are in **bold** text.

1. Under Task 3 it is indicated that PFAS-free and Teflon-free including but not limited to pipe thread tape, pipe joint adhesives/solvents, piping, valves, and valve parts are to be used. Does this requirement include obtaining documentation from the manufacturer indicating these materials are **certified** PFAS free? **No, however, the item/product Material Safety Data Sheet will need to be provided showing that the Chemical Family and/or formula is not identified on the attached MDEQ PFAS SAMPLING QUICK REFERENCE FIELD GUIDE**.

2. In the event the contractor establishes a date/time with the homeowner to collect a water sample, change a filter, or service the system and the homeowner is a "no show" at the time of the contractor's visit, will the contractor be paid for labor time and mileage? **See line item added to Revised Bid Sheet (attached).**

3. It is understood that Vista Analytical Laboratory is to be used for PFAS analysis. Is the contractor responsible for paying Vista's invoices and other associated expenses or will these expenses be direct billed by Vista to MDMVA? **Bidder should obtain pricing from Vista and include as part of their bid. Successful bidder will be expected to pay Vista invoices and recoup the money during invoicing to MDMVA.**

4. Does MDMVA have any information regarding the location types (i.e. basements, crawlspaces, garages, etc.) where whole home water filtration systems may need to be installed? **No. New placement of filter(s) is dependent upon ongoing neighborhood sampling results. For bidding purposes, assume filters will be placed in a basement. If conditions are different, MDVA and the successful bidder will discuss options and possible change order.**

5. Under Special Conditions it is indicated that "any spills, leaks, equipment failure, etc. during work, will be the contractor's responsibility to manage, cleanup, and properly dispose at no cost to the owner." Who is responsible for any system leaks, spills, etc. that may occur after the contractor has left the Site (following the service call, filter change out, etc.)? **Successful bidder should make sure there are no spills, leaks, equipment failure etc. and document conditions when leaving. If there is a spill, leak, equipment failure after the leaving, MDMVA will coordinate and discuss with the homeowner and successful bidder on course of action.**

6. On page 5 is it indicated that due to long lead times, the selected contractor will need to order 6 filters immediately and retain them for when needed. Can the contractor invoice MDMVA for all 6 filters immediately upon receipt or invoice only when the service occurs? Additionally, can the

contractor invoice for other supplies (i.e. certified PFAS free tape, piping, etc.) that are acquired and held for potential use? **The successful bidder can invoice for all 6 filters upon receiving the filters and providing documentation with their invoice. The filters will be the property of MDMVA, and if not all filters are used, will be provided to MDMVA by the successful bidder at the end of the contract. The PFAs free tape, piping etc. is incidental to the installation of the filter and should be reflected in bidders costs.**

7. On page 4 it states that if the filtration system becomes inoperable an alternate potable water source (i.e. bottled water) shall be supplied immediately. Does the responsibility and associated expense of supplying bottled water fall on the contractor? **No if bottled water is required, MDMVA will address. If MDMVA so choses to work with the successful bidder, this requirement will be negotiated.**

8. Please provide a total of number of samples to be collected for PFAS analysis. The RFP indicates there are 15 locations to be sampled quarterly with two samples (influent and effluent) to be collected at each location (total of 120 samples); however, page2 of the RFP states there are multiple filter units in the church building and women's shelter suggesting more than 120 samples will need to be collected. It is important to note that the bid table lists 18 units for sampling, not 15. **Bidder is to assume a maximum of 20 filters to be sampled on a quarterly basis. See revised line item in the Revised Bid Sheet (attached).**

9. Please clarify. As noted on page 3, are the second set of samples to be collected post-filter replacement to include a pre and post filter sample, or just the post filter sample? **Yes, water samples are to be collected pre and post filter installation if the filter has failed.**

10. Please provide a breakdown of the number of duplicate samples, blanks, etc. needed for each water sample collected so a total number of samples to be submitted to Vista for PFAS analysis can be determined. Standard water sampling QA/QC samples are to be collected: 1 duplicate/10 water samples, 1 Matrix Spike Duplicate/20 water samples, and 1 trip blank per each day of sampling.

11. Please provide the contact information for the plumber who installed the existing filtration systems.
    Brian Cataldo, President
    Greenscape General Contracting, LLC
    PO Box 133
    Lake, MI 48632
    e-mail: *bwcataldo@yahoo.com < Caution-mailto:bwcataldo@yahoo.com >*
    Phone: 989-544-2489
    Fax: 989-544-2817
    Cell: 989-329-1939

REQUEST FOR COMPETITIVE BID – PACKAGE #2022-01 REVISED BID SHEET
Grayling Home Water Sampling and Filter Replacements
MDMVA
Camp Grayling
Grayling, Michigan

Work Item	Units		Unit Cost	Events	Total Cost
Contract Management	1	lump sum		1	
Health & Safety Plan	1	lump sum		1	
Quarterly Home Water Sampling & Excel Spreadsheet	20	filters		4	
Home Owner or MDMVA requested O&M or Issue[1]	1	each		6	
Home Owner Scheduled Appointment - Owner No Show	1	each		6	
Pre & Post Filter Replacement Home Water Sampling	2	samples		15	
Home Water Filter Replacement[2]	1	filter		15	
New Home Water Filter Installation & Plumbing[3]	1	each		6	
Water Filter Installation plumbing new filter into whole home water supply[4]	1	each		6	
TOTALS					

[1]Materials are incidental to the work

[2]Materials needed after filtration system inspection are incidental to the work

[3]Includes labor, materials and filter

[4]Includes labor, materials and plumbing required to fit filter into whole home water supply

Michigan Department of Environmental Quality

MDEQ PFAS Sampling Quick Reference Field Guide[1]

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  ○ Polyvinylidene fluoride (PVDF), that includes the trademark Kynar®
  ○ Polycholotrifluoroethylene (PCTFE), that includes the trademark Neoflon ®
  ○ Ethylene-tetrafluoro-ethylene (ETFE), that includes the trademark Tefzel®
  ○ Fluorinated ethylene propylene (FEP), that includes the trademarks Teflon® FEP and Hostaflon® FEP
• Items or materials that contain any other fluoropolymer

Pumps, Tubing, and Sampling Equipment

● Prohibited	■ Allowable	▲Needs Screening[2]

• Items or materials containing any fluoropolymer (potential items include tubing, valves, or pipe thread seal tape)	• High-density polyethylene (HDPE)
	• Low-density polyethylene (LDPE) tubing
	• Polypropylene
	• Silicone
	• Stainless-steel
	• Any items used to secure sampling bottles made from:
	  ○ Natural rubber
	  ○ Nylon (cable ties)
	  ○ Uncoated metal springs
	  ○ Polyethylene
		• Any items or materials that will come into direct contact with the sample that have **not** been verified to be PFAS-free
		  ○ Do not assume that any sampling items or materials are PFAS-free based on composition alone

Sample Storage and Preservation

● Prohibited	■ Allowable	▲Needs Screening[2]
• Polytetrafluoroethylene (PTFE): Teflon® lined bottles or caps	• Glass jars[4] • Laboratory-provided PFAS-Free bottles: ○ HDPE or polypropylene • Regular wet ice • Thin HDPE sheeting • LDPE resealable storage bags (i.e. Ziploc®) that will not contact the sample media[6]	• Aluminium foil[4] • Chemical or blue ice[5] • Plastic storage bags other than those listed as ■ Allowable • Low-density polyethylene (LDPE) bottles

Field Documentation

● Prohibited	■ Allowable	▲Needs Screening[2]
• Clipboards coated with PFAS • Notebooks made with PFAS treated paper • PFAS treated loose paper • PFAS treated adhesive paper products	• Loose paper (non-waterproof, non-recycled) • Rite in the Rain® notebooks • Aluminium, polypropylene, or Masonite field clipboards • Ballpoint pens, pencils, and Fine or Ultra-Fine Point Sharpie® markers	• Plastic clipboards, binders, or spiral hard cover notebooks • All markers not listed as ■ Allowable • Post-It® Notes or other adhesive paper products • Waterproof field books

Decontamination

● Prohibited	■ Allowable	▲Needs Screening[2]
• Decon 90® • PFAS treated paper towel	• Alconox®, Liquinox®, or Citranox® • Triple rinse with PFAS-free deionized water • Cotton cloth or untreated paper towel	• Municipal water • Recycled paper towels or chemically treated paper towels

Clothing, Boots, Rain Gear, and PPE

● Prohibited	■ Allowable	▲Needs Screening[2]

• New or unwashed clothing
• Anything made of or with:
  ○ Gore-Tex™ or other water-resistant synthetics
• Anything applied with or recently washed with:
  ○ Fabric softeners
  ○ Fabric protectors, including UV protection
  ○ Insect resistant chemicals
  ○ Water, dirt, and/or stain resistant chemicals
	• Powderless nitrile gloves
	• Well-laundered synthetic or 100% cotton clothing, with most recent launderings not using fabric softeners
	• Made of or with:
	  ○ Polyurethane
	  ○ Polyvinyl chloride (PVC)
	  ○ Wax coated fabrics
	  ○ Rubber / Neoprene
	  ○ Uncoated Tyvek®
		• Latex gloves
		• Water and/or dirt resistant leather gloves
		• Any special gloves required by a HASP
		• Tyvek® suits, clothing that contains Tyvek®, or coated Tyvek®

Food and Beverages

● Prohibited	■ Allowable

• No food should be consumed in the staging or sampling areas, including pre-packaged food or snacks.
  ■ If consuming food on-site becomes necessary, move to the staging area and remove PPE. After eating, wash hands thoroughly and put on new PPE.
	• Brought and consumed only outside the vicinity of the sampling area:
	  ○ Bottled water
	  ○ Hydration drinks (i.e. Gatorade®, Powerade®)

Personal Care Products (PCPs) - for day of sample collection[6]

● Prohibited	■ Allowable	▲Needs Screening[2]
• Any PCPs[6], sunscreen, and insect repellent applied in the sampling area.	PCPs[6], sunscreens, and insect repellents applied in the staging area, away from sampling bottles and equipment followed by thoroughly washing hands: **PCPs[6]:** • Cosmetics, deodorants/antiperspirants, moisturizers, hand creams, and other PCPs[6] **Sunscreens:** • Banana Boat® for Men Triple Defense Continuous Spray Sunscreen SPF 30 • Banana Boat® Sport Performance Coolzone Broad Spectrum SPF 30 • Banana Boat® Sport Performance Sunscreen Lotion Broad Spectrum SPF 30 • Banana Boat® Sport Performance Sunscreen Stick SPF 50 • Coppertone® Sunscreen Lotion Ultra Guard Broad Spectrum SPF 50 • Coppertone® Sport High Performance AccuSpray Sunscreen SPF 30 • Coppertone® Sunscreen Stick Kids SPF 55 • L'Oréal® Silky Sheer Face Lotion 50 • Meijer® Clear Zinc Sunscreen Lotion Broad Spectrum SPF 50 • Meijer® Sunscreen Continuous Spray Broad Spectrum SPF 30 • Meijer® Clear Zinc Sunscreen Lotion Broad Spectrum SPF 15, 30 and 50 • Meijer® Wet Skin Kids Sunscreen Continuous Spray Broad Spectrum SPF 70 • Neutrogena® Beach Defense Water+Sun Barrier Lotion SPF 70 • Neutrogena® Beach Defense Water+Sun Barrier Spray Broad Spectrum SPF 30 • Neutrogena® Pure & Free Baby Sunscreen Broad Spectrum SPF 60+ • Neutrogena® UltraSheer Dry-Touch Sunscreen Broad Spectrum SPF 30 **Insect Repellents:** • OFF® Deep Woods • Sawyer® Permethrin	• Products other than those listed as ■Allowable

[1] This table is not considered to be a complete listing of prohibited or allowable materials. All materials should be evaluated prior to use during sampling. The manufacturers of various products should be contacted in order to determine if PFAS was used in the production of any particular product.

[2] Equipment blank samples should be taken to verify these products are PFAS-free prior to use during sampling.

[3] **For surface water foam samples:** LDPE storage bags may be used in the sampling of foam on surface waters. In this instance, it is allowable for the LDPE bag to come into direct contact with the sample media.

[4] **For fish and other wildlife samples:** Depending on the project objectives, glass jars and aluminum foil might be used for PFAS sampling. PFAS has been found to bind to glass and if the sample is stored in a glass jar, a rinse of the jar is required during the sample analysis. PFAS are sometimes used as a protective layer for some aluminum foils. An equipment blank sample should be collected prior to any aluminum foil use.

[5] Regular ice is recommended as there are concerns that chemical and blue ice may not cool and maintain the sample at or below 42.8°F (6°C) (as determined by EPA 40 CFR 136 – NPDES) during collection and through transit to the laboratory.

[6] Based on evidence, avoidance of PCPs is considered to be precautionary because none have been documented as having cross-contaminated samples due to their use. However, if used, application of PCPs must be done at the staging area and away from sampling bottles and equipment, and hands must be thoroughly washed after the use of any PCPs prior to sampling.

● - Prohibited ■ - Allowable ▲ - Needs Screening

From: Roebuck, Curtis (DMVA)
To: Roebuck, Curtis G NFG NG MIARNG (USA)
Subject: FW: [Non-DoD Source] RE: RFB 2022-01 Grayling Whole Home Water Filter Sampling & Installations
Date: Monday, January 3, 2022 9:44:59 AM

Curtis Roebuck
FCTC ENV Manager
2510 26th Street
Augusta, MI 49012
269-282-7611 office
517-256-6023 cell

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From: Roebuck, Curtis (DMVA)
Sent: Monday, November 22, 2021 9:46 AM
To: Lyman, Patricia (DMVA) <LymanP@michigan.gov>; Edgerly, Jonathan W NFG (USA) <jonathan.w.edgerly.nfg@army.mil>; Edgerly, Jonathan (DMVA) <JONATHAN.W.EDGERLY.NFG@MAIL.MIL>
Cc: Roebuck, Curtis G NFG NG MIARNG (USA) <curtis.g.roebuck.nfg@mail.mil>
Subject: RE: [Non-DoD Source] RE: RFB 2022-01 Grayling Whole Home Water Filter Sampling & Installations

Hello Patti,

Thanks for the comments/information. Since DLZ did not bid and Wood is disqualified for not providing all the necessary information, plus having a higher cost than Mannik and Smith, I will forward this information to Mannik and Smith and ask them if this changes their bid cost at all. Upon receiving their information, I will provide to you and Jonathan, and assuming it is satisfactory, award the bid.

Thanks,

Curtis Roebuck
FCTC ENV Manager
2510 26th Street
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517-256-6023 cell

From: Lyman, Patricia (DMVA) <LymanP@michigan.gov>
Sent: Monday, November 22, 2021 9:43 AM
To: Roebuck, Curtis (DMVA) <RoebuckC@michigan.gov>; Edgerly, Jonathan W NFG (USA) <jonathan.w.edgerly.nfg@army.mil>; Edgerly, Jonathan (DMVA) <JONATHAN.W.EDGERLY.NFG@MAIL.MIL>
Cc: Roebuck, Curtis G NFG NG MIARNG (USA) <curtis.g.roebuck.nfg@mail.mil>
Subject: RE: [Non-DoD Source] RE: RFB 2022-01 Grayling Whole Home Water Filter Sampling & Installations

I think there was some confusion regarding the water sampling for the different tasks, and the new filter system install task. Can we clarify with both bibbers the following:

Quarterly Sampling
All locations/all filters to be evaluated within a 2 week period. System must be allowed to run and flush prior to sample collection.
This evaluation will include collecting an **influent** (collected from incoming water line prior to filter unit) and an **effluent** sample (collected from sample port immediately after the filter unit).
QC samples to include: 1 duplicate per 10 samples, 1 MS/MSD per 20 samples, and 1 trip blank per day.

Indicator Light Color Changes to Red- note it is unlikely that more than one filter address will reach this status simultaneously, therefore it should be assumed that each address will require a separate sampling trip
This evaluation will include collecting an **influent** sample (collected from incoming water line prior to filter unit) and an **effluent** sample (collected from sample port immediately after the filter unit).
QC samples to include: 1 duplicate sample, 1 MS/MSD, and 1 trip blank if only one filter address is sampled on a given day.

Filter Performance Confirmation Samples Following Filter Cartridge Replacement- note it is unlikely that more than one filter address will reach this status simultaneously, therefore it should be assumed that each address will require a separate sampling trip
This evaluation will include collecting an **influent** sample (collected from incoming water line prior to filter unit) and an **effluent** sample (collected from sample port immediately after the filter unit).
QC samples to include: 1 duplicate sample, 1 MS/MSD, and 1 trip blank if only one filter address is sampled on a given day.

Also please specify with the Bidders that there should be only 1 line item for the New Home Filter System Installation (which should include all materials, labor, permits, and project management costs, including the initial site visit to assess the existing conditions and develop a installation plan, and at least 1 additional separate site visit to perform the actual install). This line was mistakenly included twice on the Bid Sheet with slightly different wording.

-

.

Patricia Byrnes Lyman
PFAS Lead/Investigation/Remediation Manager
Environmental Section, JFHQ
Michigan Army National Guard
3423 N MLK Jr BLVD
Lansing, MI 48906
Desk 517-481-7631
Mobile 517-275-0804
LymanP@Michigan.gov

From: Roebuck, Curtis (DMVA) <RoebuckC@michigan.gov>
Sent: Monday, November 22, 2021 8:38 AM
To: Edgerly, Jonathan W NFG (USA) <jonathan.w.edgerly.nfg@army.mil>; Lyman, Patricia (DMVA) <LymanP@michigan.gov>; Edgerly, Jonathan (DMVA) <JONATHAN.W.EDGERLY.NFG@MAIL.MIL>
Cc: Roebuck, Curtis G NFG NG MIARNG (USA) <curtis.g.roebuck.nfg@mail.mil>
Subject: RE: [Non-DoD Source] RE: RFB 2022-01 Grayling Whole Home Water Filter Sampling & Installations

Hello Jonathan,

Thanks.

Curtis Roebuck
FCTC ENV Manager
2510 26th Street
Augusta, MI 49012
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From: Edgerly, Jonathan W NFG (USA) <jonathan.w.edgerly.nfg@army.mil>
Sent: Monday, November 22, 2021 8:36 AM
To: Roebuck, Curtis (DMVA) <RoebuckC@michigan.gov>; Lyman, Patricia (DMVA) <LymanP@michigan.gov>; Edgerly, Jonathan (DMVA) <JONATHAN.W.EDGERLY.NFG@MAIL.MIL>
Cc: Roebuck, Curtis G NFG NG MIARNG (USA) <curtis.g.roebuck.nfg@mail.mil>
Subject: RE: [Non-DoD Source] RE: RFB 2022-01 Grayling Whole Home Water Filter Sampling & Installations

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I spoke with Patti about this mid last week. She should be contacting you directly to discuss her concerns. I have verbally provided both of you my comments.

Jonathan W. Edgerly
Michigan Army National Guard
Environmental Manager
3423 N MLK Jr BLVD
Lansing, Mi 48906
517-481-7630 / 517-599-5644 (c)
Jonathan.w.edgerly.nfg@army.mil

Conference Line
517-481-7100,,1109#,,7630#

From: Roebuck, Curtis (DMVA) <RoebuckC@michigan.gov>
Sent: Monday, November 22, 2021 8:11 AM
To: Lyman, Patricia (DMVA) <LymanP@michigan.gov>; jonathan.w.edgerly.nfg <jonathan.w.edgerly.nfg@mail.mil>; Edgerly, Jonathan W NFG (USA) <jonathan.w.edgerly.nfg@army.mil>
Cc: Roebuck, Curtis G NFG NG MIARNG (USA) <curtis.g.roebuck.nfg@mail.mil>
Subject: [Non-DoD Source] RE: RFB 2022-01 Grayling Whole Home Water Filter Sampling & Installations

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Hello Patti,

What is the status of your review? It's been a week now and I need to let the bidders know the results.

Thanks,

Curtis Roebuck
FCTC ENV Manager
2510 26th Street
Augusta, MI 49012
269-282-7611 office
517-256-6023 cell

From: Lyman, Patricia (DMVA) <LymanP@michigan.gov>
Sent: Monday, November 15, 2021 11:10 AM
To: Roebuck, Curtis (DMVA) <RoebuckC@michigan.gov>; Edgerly, Jonathan (DMVA) <JONATHAN.W.EDGERLY.NFG@MAIL.MIL>; Edgerly, Jonathan W NFG (USA) <jonathan.w.edgerly.nfg@army.mil>
Cc: Roebuck, Curtis G NFG NG MIARNG (USA) <curtis.g.roebuck.nfg@mail.mil>
Subject: RE: RFB 2022-01 Grayling Whole Home Water Filter Sampling & Installations

Thank you. I will begin reviewing this info tomorrow. I am on comp time today.

Patricia Byrnes Lyman
PFAS Lead/Investigation/Remediation Manager
Environmental Section, JFHQ
Michigan Army National Guard
3423 N MLK Jr BLVD
Lansing, MI 48906
Desk 517-481-7631
Mobile 517-275-0804
LymanP@Michigan.gov < Caution-mailto:LymanP@Michigan.gov >

From: Roebuck, Curtis (DMVA) <RoebuckC@michigan.gov < Caution-mailto:RoebuckC@michigan.gov > >
Sent: Monday, November 15, 2021 10:45 AM
To: Lyman, Patricia (DMVA) <LymanP@michigan.gov < Caution-mailto:LymanP@michigan.gov > >; Edgerly, Jonathan (DMVA) <JONATHAN.W.EDGERLY.NFG@MAIL.MIL < Caution-mailto:JONATHAN.W.EDGERLY.NFG@MAIL.MIL > >; Edgerly, Jonathan W NFG (USA) <jonathan.w.edgerly.nfg@army.mil < Caution-mailto:jonathan.w.edgerly.nfg@army.mil > >
Cc: Roebuck, Curtis G NFG NG MIARNG (USA) <curtis.g.roebuck.nfg@mail.mil < Caution-mailto:curtis.g.roebuck.nfg@mail.mil > >
Subject: RFB 2022-01 Grayling Whole Home Water Filter Sampling & Installations

Hello Patti & Jonathan,

Attached for your review & input are the bids and my evaluation sheet. DLZ declined to bid due to 24 hour response time, and they didn't think they could respond. The qualified low bidder is Mannik & Smith $140845.34 compared to Wood $357935.00.

Any questions let me know. Upon your concurrence I will inform the bidders of the selection and get the contract paperwork started.

Thanks,

Curtis Roebuck
FCTC ENV Manager
th

2510 26 Street
Augusta, MI 49012
269-282-7611 office
517-256-6023 cell

From: Roebuck, Curtis (DMVA)
To: Roebuck, Curtis G NFG NG MIARNG (USA)
Subject: [Non-DoD Source] FW: Bid 2022-01 Bid Clarification
Date: Monday, January 3, 2022 9:47:59 AM
Attachments: Bid 2022-01 Bid Clarification.docx

Curtis Roebuck
FCTC ENV Manager
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From: Roebuck, Curtis (DMVA)
Sent: Monday, November 22, 2021 10:27 AM
To: wbolt@manniksmithgroup.com; Melanie Bidwell <MBidwell@manniksmithgroup.com>
Cc: Lyman, Patricia (DMVA) <LymanP@michigan.gov>; Edgerly, Jonathan (DMVA) <JONATHAN.W.EDGERLY.NFG@MAIL.MIL>
Subject: Bid 2022-01 Bid Clarification

Hello Walter,

During review of the bids, we determined that some clarification was needed to assure both bidder and MDMVA are on the same page prior to bid award. Attached is the Bid 2022-01 Bid Clarification document for your completion. Any questions please let me know.

Thanks,

Curtis Roebuck
FCTC ENV Manager
2510 26th Street
Augusta, MI 49012
269-282-7611 office
517-256-6023 cell

Bid Clarification
Bid Package #2022-01 - Grayling Home Water Sampling and Filter Replacements

Bid Clarification is due via email to Curt Roebuck (roebuckc@michigan.gov) by Noon, November 24, 2021.

During review of the bids, we determined that some clarification was needed to assure both bidder and MDMVA are on the same page prior to bid award. Please respond to the requested clarifications below. Additionally, please acknowledge if you bid cost is valid. If not and changes are needed based on the clarifications, please update and submit a new bid sheet. Any questions, please email Curt Roebuck roebuckc@michigan.gov.

1. **Quarterly Sampling**

All locations/all filters to be evaluated within a 2 week period. System must be allowed to run and flush prior to sample collection.

This evaluation will include collecting an **influent** (collected from incoming water line prior to filter unit) and an **effluent** sample (collected from sample port immediately after the filter unit).

QC samples to include: 1 duplicate per 10 samples, 1 MS/MSD per 20 samples, and 1 trip blank per day.

2. **Indicator Light Color Changes to Red and/or Filter cartridge needs to be replaced – (note it is unlikely that more than one filter address will reach this status simultaneously, therefore it should be assumed that each address will require a separate sampling trip).**

This evaluation will include collecting an **influent** sample (collected from incoming water line prior to filter unit) and an **effluent** sample (collected from sample port immediately after the filter unit) prior to filter cartridge replacement.

QC samples to include: 1 duplicate sample, 1 MS/MSD, and 1 trip blank if only one filter address is sampled on a given day.

3. **Filter cartridge Performance Confirmation Samples Following Filter Cartridge Replacement- (note this task is required 3 days after filter cartridge replacement, therefore it should be assumed that each address will require a separate sampling trip, and cannot be performed the day of the filter cartridge replacement.)**

This evaluation will include collecting an **influent** sample (collected from incoming water line prior to filter unit) and an **effluent** sample (collected from sample port immediately after the filter unit).

QC samples to include: 1 duplicate sample, 1 MS/MSD, and 1 trip blank if only one filter address is sampled on a given day.

From: Roebuck, Curtis (DMVA)
To: Roebuck, Curtis G NFG NG MIARNG (USA)
Subject: [Non-DoD Source] FW: Bid 2022-01 Bid Clarification - Mannik Smith Group
Date: Monday, January 3, 2022 9:22:54 AM
Attachments: OP212443 Revised Bid Tab.pdf

Curtis Roebuck
FCTC ENV Manager
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From: William Prall <WPrall@manniksmithgroup.com>
Sent: Wednesday, November 24, 2021 9:29 AM
To: Roebuck, Curtis (DMVA) <RoebuckC@michigan.gov>
Cc: Walter Bolt <wbolt@manniksmithgroup.com>; Melanie Bidwell <MBidwell@manniksmithgroup.com>; Lyman, Patricia (DMVA) <LymanP@michigan.gov>; Edgerly, Jonathan (DMVA) <JONATHAN.W.EDGERLY.NFG@MAIL.MIL>
Subject: Bid 2022-01 Bid Clarification - Mannik Smith Group

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Mr. Roebuck,

Thank you for allowing us to revise laboratory costs based upon the clarified sampling regimen you provided. In review of the three sampling scenarios, we determined that additional samples and laboratory costs would need to be added to our bid. In speaking with Vista, they stated that they would charge for trip blanks, MS/MSD samples, and duplicates at the same rate as the collected sample. By adding these to each filter pre and post change sampling event and assuming each event would be a separate sampling event requiring the duplicate, trip blank, and MS/MSD, we came to a number of 5 samples per house per event (10 when including the pre and post filter change in total). This took the total number of samples for pre and post filter sampling to 150 in accordance with the number of houses specified in the bid tab. We were able to negotiate a slightly lower per sample rate with the lab based on the additional number of sample per your request, however the total price of the bid has increased as you will see in your review.

If you should have any additional questions or require any additional information regarding the attachment, please don't hesitate to let Walt or I know.

We look forward to hearing from you regarding this site.

Thank you,

Bill

Bill Prall, CP, CPG
The Mannik & Smith Group
868 Robinwood Court
Traverse City, MI 49686
(231) 929-7330 x6911
Cell (231) 343-3483

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F. BID SHEET

REQUEST FOR COMPETITIVE BID – PACKAGE #2022-01
Grayling Home Water Sampling and Filter Replacements
MDMVA
Camp Grayling
Grayling, Michigan

Work Item	Units		Unit Cost	Events	Total Cost
Contract Management	1	lump sum	$0.00	1	$0.00
Health & Safety Plan	1	lump sum	$3,790.00	1	$3,790.00
Quarterly Home Water Sampling & Excel Spreadsheet	20	homes	$15,512.15	4	$62,048.60
Home Owner or MDMVA requested O&M or Issue[1]	1	each	$1,684.37	6	$10,106.20
Home Owner Scheduled Appointment – Owner No Show	1	each	$200.00	6	$1,200.00
Pre & Post Filter Replacement Home Water Sampling	2	samples	$3,150.57	15	$47,258.60
Home Water Filter Replacement[2]	1	filter	$1,258.95	15	$18,884.30
New Home Water Filter Installation & Plumbing[3]	1	each		6	
Water Filter Installation Plumbing New Filter into Whole Home Water Supply[4]	1	each	$4,786.27	6	$28,717.64
TOTALS					$172,005.34

[1]Materials are incidental to the work
[2]Materials needed after filtration system inspection are incidental to the work
[3]Includes labor, materials and filter
[4]Includes Labor, materials and plumbing required to fit filter into whole home water supply

The above bid table was adapted from the table provided in the Addendum dated November 11, 2021. The costs for installation of new whole home systems has been included in the "Water Filter Installation Plumbing New Filter into Whole Home Water Supply" task. The prior task listed on the bid table appears to be asking for the same information, and has therefore a price has not been listed for fear of duplicating costs in the total bid. The Breakdown of costs for the new whole home filter installation is as follows:

Plumber and Electrician Fees - $2,000.00
New Aquasana System Purchase - $1,907.99
Mannik Smith Management and Oversight Fees - $878.28

Total Purchase and Installation Cost: $4,786.27

Appendix E: Alternative Water Supply Management Plan Point-of-Entry Treatment Systems

OHM Advisors®
300 EAST MITCHELL STREET SUITE 2 PETOSKEY
MICHIGAN 49770 T 231.344.1150 OHM-Advisors.com

Rose & Westra
A Division of GZA

GEOTECHNICAL
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CONSTRUCTION MANAGEMENT

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601 Fifth Street NW
Suite 102
Grand Rapids, MI 49504
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www.rosewestra.com
www.gza.com

Alternate Water Supply Management Plan Point-of-Entry Treatment Systems

Wolverine World Wide, Inc.

January 16, 2018
Revisions: May 15, 2018, October 10, 2018, March 6, 2019, April 6, 2020, and September 16, 2020

File No. 16.0062335.51/16.0062961.60

PREPARED BY:

Rose & Westra, a Division of GZA GeoEnvironmental, Inc.
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TABLE 1 PFAS ANALYTICAL PARAMETERS AND REPORTING LIMITS (FOLLOWS TEXT)

APPENDICES

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APPENDIX B SAMPLE RESIDENT INFORMATION CARD
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APPENDIX E GRANULAR ACTIVATED CARBON DESIGN

1.0 INTRODUCTION

This Alternate Water Supply Management Plan provides a description of the design, installation, operation, and maintenance related to Point-of-Entry Treatment (POET) systems offered to property owners in Plainfield and Algoma Townships, Michigan. Rose & Westra, a Division of GZA (R&W/GZA), has prepared this plan on behalf of Wolverine World Wide, Inc. (Wolverine) for use by Wolverine and its consultants and contractors. This plan, along with the appendices, presents information related to the operation and maintenance (O&M) of the POET systems.

This April 6, 2020 update presents changes pursuant to Consent Decree (CD) No. 1:18-cv-00039-JTM-ESC, effective February 19, 2020. The changes made to the POET O&M are established in Section 7.5 and Appendix L of the CD. The changes are primarily establishing a routine carbon change-out schedule and routine monitoring.

1.1 PROJECT BACKGROUND

In July 2017, Per- and Polyfluoroalkyl Substances (PFAS) were detected in water from a well in the House Street area, and since then, Wolverine has worked with the Michigan Department of Environment, Great Lakes, and Energy (EGLE), the Michigan Department of Health and Human Services (MDHHS), and the Kent County Health Department (KCHD) to sample private wells in the area. Wolverine immediately provided bottled water to potentially affected residences and available results have been shared with individual property owners and will continue to be shared as additional sampling takes place. Wolverine has provided and installed point-of-use (POU) and whole house POET systems. A separate maintenance memorandum has been completed for the POU filters. This is included as **Appendix A**. Since 2017, Wolverine has sampled over 1500 homes and installed and maintained over 530 POET systems. In addition, Wolverine has collected thousands of performance samples for the POET systems.

1.2 PLAN ORGANIZATION

This plan includes the following sections:

- Section 1 – Introduction: Provides an overview and background of the project objectives.
- Section 2 – Residential Well Identification, Monitoring, and Bottled Water Service: Provides an overview of the search areas, and past and future sampling plans.
- Section 3 – Communications with Affected Property Owners: Provides a description of communications with affected property owners.
- Section 4 – POET Systems: Presents a description of the POET systems and operation overview.
- Section 5 – O&M: Summarizes the O&M plans for the POET systems.
- Section 6 – Monitoring: Presents a description of work of the sampling and analysis plan for the POET systems.
- Section 7 – Cessation: Presents a description of the cessation of the POET system O&M as provided by Wolverine.

2.0 RESIDENTIAL WELL IDENTIFICATION, MONITORING, AND BOTTLED WATER SERVICE

2.1 INITIAL ACTIVITIES

Following the detection of PFAS in the House Street area, Wolverine began working with EGLE and MDHHS/KCHD to sample wells in the area. Wolverine offered to sample wells within the various sampling areas associated with

House Street as well as those in Wolven/Jewell, and provided bottled water while the laboratory results were pending.

2.2 PRIVATE WELL SAMPLING

If a drinking-water well was present on the property, permission to collect a groundwater sample for laboratory analysis was requested by R&W/GZA. R&W/GZA has maintained a list of locations where private wells have or have not been sampled. Additional residential drinking water well resampling will be conducted as part of the CD implementation (per Residential Well Resampling RAP, draft submitted May 2020). However, that sampling will be completed under a separate work plan.

3.0 COMMUNICATIONS WITH AFFECTED PROPERTIES

All members of the public can access the following websites to learn about the groundwater investigation and communications:

- 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

Additionally, each residence with a POET system installed was provided a reference card with contact information. A copy of the current reference card is included in **Appendix B**. A copy of the card has been provided to POET owners for which Wolverine currently maintains O&M responsibility.

Wolverine provides regular communication to the residents, including routine sample results, changes to the monitoring schedule, the above-mentioned reference card, and correspondence about general O&M. This communication is completed via email, mail, and telephone.

4.0 POET SYSTEMS

4.1 TREATMENT SYSTEM DESCRIPTION

POET systems were installed to treat water as it enters the building from the private well. Generally, the system was installed following the softener for wells with concentrations of PFOS+PFOA less than 70 parts per trillion (ppt). When the well concentration exceeds 70 ppt for PFOS+PFOA, the system was installed prior to the softener, thus treating all of the water. POET systems were typically installed where the existing water utilities were located, if space was available. Based on this installation, POET systems are designed to provide treated water to all fixtures such as sinks, showers/baths, and toilet and outside spigots when the concentration of PFOS+PFOA exceeds 70 ppt. If sample results find that the concentrations of PFOS+PFOA increases from below 70 ppt to above 70 ppt, the POET system will be re-piped to perform treatment prior to water softening.

Although the foregoing is a general rule regarding the installation, it should not be inferred that an installation following the softener will provide treatment for all Drinking Water Fixture Units (DFUs) in the home/building.

Pre-softener branch service lines are common for drinking water taps and automatic-ice makers. As such, multiple inspections were performed to locate and treat all interior DFUs. An initial inspection (pre-installation) was performed by Culligan, the installer. Following installation, an initial sampling event was scheduled. The R&W/GZA sampling team reviewed and completed a checklist of the installation. One of the checklist items was to check for interior lines that were not piped to the influent of the POET systems.

The POET systems remove PFAS compounds through adsorption to granulated activated carbon (GAC). GAC is used in common household filters and POET systems, and have a proven track record for many applications, including for treatment of PFAS at multiple sites across the U.S. Additional information about GAC is provide in **Appendices D and E**. The POET systems connect to the existing water supply and distribution within the house. For commercial properties and high-water use residences, Wolverine has modified the typical installation to address additional requirements (as applicable). Multiple GAC columns have been installed in some situations.

The Culligan O&M Manual is included as **Appendix C** for reference/informational purposes only. A schematic of a typical POET system is also included in **Appendix C**. Provided below is a description of the major components of the POET system:

- Pre-filter:
  - Removes sand and sediment from the well water.
- Lead GAC:
  - Removes PFAS and other constituents that sorb to GAC. The GAC vessels are filled with Calgon F600 AW GAC. A typical POET system utilizes a 2-cubic-foot GAC vessel; however, in locations with the highest concentrations or high flows, multiple 2-cubic-foot vessels are utilized.
- Lag GAC:
  - Redundant vessel in case breakthrough occurs on the lead GAC.
- Post-filter:
  - Removes sand and sediment from treated water.
- Flow meter:
  - Monitors the volume of water treated/used.
- Ultra-Violet (UV) Lamp:
  - Removes bacteria that may be in the well water or present within the GAC vessels.

The nominal Empty Bed Contact Time (EBCT) 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, a four column GAC system was installed to allow for a “high flow” water use of 16 gpm. There is no set protocol for installing the “high-flow” four-column system. In each building, its drinking water supply and needs was reviewed individually. The review may have included, but was not necessarily limited to, inlet water pressure, pressure loss with flow, DFU’s, number of occupants, and size of home. A second criterion for the installation of multiple GAC columns was PFOS+PFOA concentration. Installations with total PFAS concentrations that exceed 7,500 ppt were identified as “high concentration” installations. The nominal EBCT for high concentration installations is 8 minutes.

4.2 OPERATION OVERVIEW

The POET systems operate using the existing water supply and pressurized flow from the existing pressure tank (or well pump if a pressure tank is not present) within the house. No additional pumps are needed as the water flows through the POET system and the PFAS are filtered out. The UV lamp is connected to household electrical service, but everything else is operated through hydraulic pressure provided by the existing pressure tank (or well pump). Once the water passes through the POET system, it enters the existing piping network within the house.

Sampling ports were installed prior to the POET systems, between the lead and lag GAC units, and after the POET systems to monitor performance (Section 6.0). Routine maintenance (Section 5.0) is completed by Culligan and monitoring is completed by R&W/GZA. The maintenance and monitoring are performed at Wolverine's expense.

All maintenance is pre-scheduled and does not require significant downtime (i.e., more than several hours). Residents are notified by the service representative before the water supply is temporarily interrupted so they may fill containers with water if needed during the service call. While it is unlikely a circumstance would occur that a POET system is down for maintenance other than a brief period during service, Wolverine will offer bottled water to residents in the event a long-term down period occurs.

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 outlined in the POU O&M memo.

4.3 POET SYSTEM STARTUP

An initial site visit was completed by Culligan to assess the existing water system and to select the optimal location for installation of the POET system. The basement has generally been identified as the optimal location for the POET system; however, if there is insufficient space, an alternative location may need to be identified.

Culligan then installed the system(s) as shown in **Appendix C** and in accordance with applicable plumbing codes. Approximately 200 gallons of water was flushed through the system to check piping connections, sampling ports, and flowmeter performance. Following the system flush, samples were collected as indicated in Section 6.0.

If the POET 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 any use. This information is provided in the resident reference card (**Appendix B**).

4.4 POET SYSTEM SHUTDOWN

In the event that one of the conditions in Section 7 of the CD and the O&M Plan statement of work (SOW) applies to a residence with a POET system, this system may be disconnected and can be removed. This is further discussed in Section 7.0.

Refer to informational **Appendix C** for the procedures for GAC management by Culligan and Calgon. In brief, the GAC will be managed to minimize and control any release of PFAS. The spent carbon will either be transported to Calgon where it will be reactivated and the PFAS will be destroyed or it will be disposed of in an approved landfill facility.

5.0 OPERATION AND MAINTENANCE (O&M)

O&M of the POET systems will be conducted by Culligan in coordination with each homeowner. Monitoring will be completed by R&W/GZA. The maintenance and monitoring will be performed at Wolverine's expense until one of the conditions in Section 7.5(b)-(f) of the CD, and the POET and POU O&M Plan SOW is met for that residence. Culligan contact information was supplied to the homeowner at the time of POET system installation. Routine maintenance for POET systems is well understood given their long-established use but vary for each POET depending on water usage and water chemistry. O&M will be tailored to each POET system based on monitoring (Section 6.0) to be protective of human health and to minimize interruptions for the homeowners once system performance and maintenance requirements have been established.

Homeowners are able to contact Wolverine, R&W/GZA, and/or Culligan directly to request assistance with their POET systems or to ask any questions regarding the system use and O&M.

5.1 PRESSURE/FLOW ISSUES

Reports of low pressure/flow are addressed in several ways; however, in general, the following protocol is used:

- Culligan performs an inspection of the system with the homeowners. The pressure gauges are read with demand. In addition, Culligan performs an informal assessment of the DFU and occupancy to determine if a high-flow system is required.
- If the Culligan review indicates the reported pressure/flow issue relates to the size of the POET system, a high-flow system is installed.
- If the Culligan review finds the influent pressure readings are low, a licensed well contractor will be scheduled to review the system and make adjustments if appropriate. Appropriate adjustments include replacing defective pressure switches and adjusting the pressure switches.
- If the licensed well contractor identifies other causes of pressure or flow issues, these are individually addressed, and corrections are made to resolve the homeowners pressure/flow issues.

5.2 SCHEDULE OF ACTIVITIES

Routine maintenance will be conducted at the following schedule:

- Pre- and post-filter replacement – every 4 months;
- A site inspection is completed during filter replacement to assess the condition of the POET system components (the UV quartz sleeve is cleaned, if needed, during these visits);
- UV quartz sleeve and lamp replacement – every 12 months; and
- GAC canister replacement – based on performance monitoring and as agreed upon in the CD and Section 5.5 of this plan.

The schedule for routine maintenance was established after performance monitoring data was gathered for over 24 months. Homeowners were notified via mail or email of revisions to the O&M schedule. Copies of these notifications have been provided to EGLE.

5.3 WATER USAGE MONITORING

The flow meter volume will be documented at each property during the maintenance and performance monitoring events.

5.4 SEDIMENT FILTER CHANGE OUT

The pre- and post-sediment filter cartridges will be replaced every four months while in the O&M program provided by Wolverine.

The differential pressures across the POET systems will be documented at each property during each maintenance monitoring event. Section 5.0 includes responses to reports of low flow. If pressure readings by Culligan confirm an excessive pressure drop at any point in the system (sediment filter, GAC filter, etc.) that is the cause of a low flow, a correction will be made. These evaluations will be on-going and are specific for each system. Each instance is evaluated and addressed, as applicable.

5.5 GAC VESSEL CHANGE OUT

The frequency of change out of the GAC vessels is established in the February 19, 2020 CD. These change out frequencies are established below:

Monitoring Interval prior to CD	Proposed Carbon Change Out Intervals*
Weekly	6 months
Monthly	12 months
Quarterly	16 months
Semi-Annual	16 months
Annual	20 months**

* Carbon change out is removing the lead carbon vessel(s) and moving the lag vessel(s) into the lead position and installing a new vessel(s) in the lag position(s). This is detailed below. On a case-by-case basis, carbon change outs may occur off-schedule when unique issues such as unexpected pressure drop occurs across the POET system. If a POET system has been installed or a carbon change out has occurred at an individual address within six months prior to the Effective Date of the CD, that POET system will automatically be put on the carbon change-out schedule and monitoring will cease. Wolverine, after consultation with and approval from EGLE, may agree to postpone or cancel a scheduled change out to accommodate the scheduled installation of municipal water for the home. For example, if a carbon change out is scheduled 3 months or less prior to the scheduled municipal connection, the change out may be cancelled.

** The change out will occur earlier than 20 months if there is a demonstrated reduction in flow rate or increased pressure drop across the POET system prior to the expiration of 20 months (i.e., evidence of physical clogging rather than carbon exhaustion due to PFAS burden).

Additionally, if during performance monitoring, a carbon change out will be completed when total PFOS+PFOA concentrations in a sample from the mid-point port (after the lead GAC vessel but prior to the lag GAC vessel) are greater than 35 nanogram per liter (ng/L). If a detection is found in a mid-point sample between the most restrictive, applicable PFAS drinking water criteria and 35 ppt, if an effluent sample was not collected at the same time as that mid-point sample the resident will be contacted as soon as possible to schedule an effluent sampling. The effluent sample will be compared to the trigger levels described in this section.

In addition, the GAC vessels may also be changed out due to reduced water delivery performance resulting from iron/carbonate build-up in the GAC. Pressure drop across the GAC vessels will be assessed during the routine O&M visits.

Routine GAC vessel change out will be conducted as follows:

- Remove the lead GAC vessel;
- Disconnect the lag GAC vessel and install in the lead position; and
- Install a replacement GAC vessel in the lag position.

Consistent with the American Water Works Association Standard 8604, the new media must soak in water for 24 to 48 hours before operation. With the exception of the Armory and Consolata Sisters installations, Culligan prepares a GAC vessel and performs the soak in their shop prior to delivery and installation. By this method, the GAC columns can be delivered and immediately placed into service.

A detection of PFOS+PFOA in a POET system effluent will be reviewed promptly. If the concentration is less than 10 ppt PFOS+PFOA and found on start-up, subsequent sampling will be evaluated. If the result is greater than 10 ppt PFOS+PFOA (or applicable criteria) and rising, the response will include changing out the lead vessel, moving the former lag vessels to the lead position 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 will be made to the system as necessary.

For the Armory and Consolata Sisters installations, the systems are designed to allow for the operation of one filter while the replaced carbon is allowed to soak for 24 to 48 hours. If possible, the media in only one filter at a time will be replaced to provide PFAS free water for the 24 to 48 hours needed to soak new media for the Armory and Consolata Sisters installations. Since the performance monitoring of these systems will not change, the above protocol for carbon change out will remain (i.e., based on performance monitoring; not a routine, scheduled interval).

The initial round of carbon change outs will be completed over an approximately four-to-eight month period after the Effective Date of the CD. The change outs will be prioritized by PFAS concentrations, with the pre-CD weekly intervals being the first group. Once a carbon change out has occurred at an individual system, the specified carbon change-out schedule will begin for that particular address (i.e., if a current weekly system is changed March 1, 2020 as part of the initial change out, the six-month schedule will be triggered with the next scheduled change on September 1, 2020 and so on).

5.6 UV SYSTEM MAINTENANCE AND CHANGE OUT

The UV lamp will be replaced on a 12-month basis as indicated by the manufacturer's recommendation.

Cleaning of the UV quartz sleeve is dependent on water hardness. The quartz sleeve will be inspected every four months and, if required, cleaned.

A brightly colored label was placed on the UV units with "Fluorescent Lamp: Do Not Disturb." In addition, this sticker includes "Warning: May contain scalding water."

6.0 MONITORING

The monitoring program was developed to verify POET system performance, inform O&M activities (Section 5.0), and communicate conditions and results to the affected private well owners. The monitoring program includes the sampling and analyses plan, data management, and reporting.

6.1 SAMPLING AND ANALYSIS PLAN

This section provides a sampling and analysis plan (SAP) for monitoring POET systems installed in residences or commercial buildings.

The SAP covers:

- Objectives of sampling;
- Sampling schedules;
- Preparation;
- Collection of samples and documentation;
- Sample shipment; and
- Analytical procedures and parameters.

The sampling methods summarized herein will be performed by R&W/GZA on behalf, and under the direction, of Wolverine. The monitoring will be performed at Wolverine's expense.

6.1.1 Objective

The goal of the SAP is to verify that POET systems are operated and maintained in a manner that reduces PFOS+PFOA to concentrations below 10 ng/l or applicable criteria.

6.2 ANALYTICAL METHOD AND PARAMETERS

PFAS will be analyzed using U.S. Environmental Protection Agency (EPA) Method 537 (rev. 1.1). The analytical parameters presented in Table 1 represent the 14 PFAS compounds and reporting limits used to evaluate the POET systems. A baseline water profile was developed for each POET system by analyzing the following parameters at startup: hardness and iron.

6.3 SAMPLING SCHEDULE

Sampling was conducted in three phases: startup, performance, and routine monitoring. Startup monitoring was intended to assess system integrity immediately following installation. Performance monitoring was intended to establish O&M schedules necessary to achieve water quality objective based on site-specific operating conditions. Routine monitoring is designed to monitor system performance on an ongoing basis, once site-specific O&M parameters are defined.

6.3.1 Startup Monitoring

After quality control inspections are complete, but before startup sample collection takes place, approximately 200 gallons were processed through the system by the installer. The treated water was discharged into the homeowner's drain(s) and septic system. Startup samples were collected as follows:

- Homes with previous non-detect well sample: influent only;
- Homes with 1 – 1,000 ppt total PFOS+PFOA: influent and mid-point sample; and
- Homes with higher than 1,000 ppt total PFOS+PFOA: influent, mid-point, and effluent sample.

6.3.2 Performance Monitoring Schedule

Performance monitoring was 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. Initial performance sampling was conducted as follows:

- Homes with previous non-detect well sample: annual sampling of the influent. If low level PFOS+PFOA was observed in the influent, the home was placed into the 1 – 70 ppt group;
- Homes with 1 – 70 ppt total PFOS+PFOA: semi-annual sampling (influent and mid-point). If changes to the influent concentration fell into a different concentration range, the sampling frequency was adjusted accordingly;
- Homes with 71 – 1,000 ppt total PFOS+PFOA: Quarterly sampling (influent, mid-point);
- Homes with 1,001 – 30,000 ppt total PFOS+PFOA: Monthly sampling (influent, mid-point, and effluent); and
- Homes with 30,001+ ppt total PFAS: Weekly sampling (influent, mid-point, effluent).

6.3.3 Routine Monitoring Schedule

A routine monitoring schedule was to be established after a lead vessel breakthrough frequency is established for each system (defined as total PFOS+PFOA > 35 ppt). However, breakthrough was not established prior to the effective date of the CD.

The CD establishes a new routine sampling protocol for the POET systems, summarized in the following.

After the Effective Date of the CD, until the first carbon change out at each individual residence for (a) POET systems in municipal water areas, and (b) POET systems in filter areas where influent concentrations are above 10 ppt for PFOS+PFOA (or any applicable criteria), the following routine monitoring will be performed:

Influent Concentration Range Interval (PFOS+PFOA ppt)	Monitoring Interval Prior to CD	Proposed Monitoring after Effective Date of the CD until the first Carbon Change Out at Each Individual Residence
30,000+ (total PFAS)	Weekly	Monthly
1,001 - 30,000	Monthly	Quarterly
71 - 1,000	Quarterly	Semi-Annual
1 - 70	Semi-Annual	None, if sampled since July 1, 2019. If not sampled since July 1, 2019, one additional sample will be collected within the first eight months after CD is effective.
Non-Detect	Annual	None, if sampled since July 1, 2019. If not sampled since July 1, 2019, one additional sample will be collected within the first eight months after the CD is effective.

The notification process and GAC change-out triggers are discussed in Section 6.10.1.

After each carbon change out, R&W/GZA will schedule a site visit to confirm configuration and operation of the POET systems.

Once the presumptive carbon change outs begin, the following routine monitoring will be conducted. The sampling will be completed approximately 2 -4 weeks after the individual carbon change out occurs.

Influent Concentration Range Interval (PFOS+PFOA ppt)	Monitoring Interval Prior to CD	Proposed Carbon Change Out Intervals	Percentage of Random Systems Sampled after GAC Change Out (CO)*	Ports Sampled for Performance Monitoring**
30,000+ (total PFAS)	Weekly	6 months	100% first GAC CO and 25% subsequent GAC COs	IN-MP-EF
1,001 - 30,000	Monthly	12 months	100% first GAC CO and 12% subsequent GAC COs	IN-MP-EF
71 - 1,000	Quarterly	16 months	10%	IN-MP
1 - 70	Semi-Annual	16 months	5%	IN-MP
Non-Detect	Annual	20 months	5%	IN

*For the three POET systems installed in the filter areas with known influent concentrations over 70 ppt PFOS+PFOA, influent and mid-point monitoring samples will be collected one time between each carbon change out.

**IN= Influent, MP = Midpoint, and EF = Effluent

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.

6.4 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.

6.4.1 Bottle Ware

New bottle ware will be used to transport samples for laboratory analyses and will be provided by the laboratory performing the analyses. The bottles will be prepared by the laboratory according to the analytical method and certified as clean. The bottles will not be opened until immediately before sample collection.

6.4.2 Field QA/QC

The following field quality control samples will be collected at a rate of one per 20 samples collected in accordance with the Project Quality Assurance Project Plan (QAPP): Field blanks, field duplicates, and matrix spike/matrix spike duplicates.

- Field blanks will be collected by pouring laboratory-supplied certified PFAS-free water into a sample container at the point of sample collection. The purpose of field blanks is to assess potential cross-contamination at the sample point.
- Field duplicates will be collected by filling one additional sample container with water from the sample point. The purpose of field duplicates is to assess variability in sample composition. Field duplicates are not intended to be blind duplicates.
- Matrix spike/matrix spike duplicate (MS/MSD) will be collected by filling two additional sets of sample bottles with water from the sample point. MS/MSD analyses are conducted by the analytical laboratory after samples have been collected and submitted. Analysis of known concentrations of analytes spiked in the MS/MSD samples indicate if matrix interference effects are occurring.

- QA/QC samples will be collected using the methods described in Section 6.7 and labeled as described in Section 6.63 The location of QA/QC samples will be entered into the Monitoring Checklist. QA/QC samples will be analyzed using the same analytical methods used for the primary sample.

6.4.3 Sample Naming and Labels

Sample numbers will consist of identification numbers that include the unique property identification (ID) and the sample port, (e.g., AA-influent, AF-mid-point, CM-effluent, etc.). Sample numbers for each POET system will be repeated for each sampling event with consistent spelling, with the two-digit sample date added to the end (i.e., AA-influent-day/month).

To prevent misidentification of samples, legible labels will be affixed to each sample container. The labels will be sufficiently durable to remain legible even when wet and contain the following information:

- Property ID;
- Sampling port location (i.e., influent, mid-point or effluent as shown on Figure 3);
- Name or initials of collector; and
- Date and time of collection.

6.4.4 Sample Collection Methods

Each POET system treats water at the point where it enters a residence and downstream of any equipment such as pressure tanks. Treatment system components are installed in series and include: two, 2-cubic-foot carbon vessels.

POET systems include three separate sample ports: influent, mid-point, and effluent. The influent port is situated between the pre-filter and lead carbon vessel. The mid-point sample port is situated between carbon vessels. The effluent sample port is situated after the totalizing meter.

6.4.5 Sample Collection

Field personnel will assess whether or not the treatment system has undergone regular use by checking the volume of water processed through the treatment system since the last visit. The field personnel will then check the system for leaks or damage and report any leaks or damage to the R&W/GZA project manager.

Samples will be collected from the effluent, mid-point, and then influent ports using the R&W/GZA Sampling Procedure for PFAS as specified in Standard Operating Procedure B-1 of the project-specific QAPP. Samples will be labeled according to Section 6.3.3, preserved according to Section 6.6.6, and a chain-of-custody (COC) filled out per Section 6.6.7. All samples will be shipped to the laboratory for analysis; the analyte list and reporting limits presented in Table 1 will be followed.

The Project Specific QAPP for PFAS prepared for EGLE by R&W/GZA outlines the sampling procedures. This was submitted to EGLE separate from this management plan.

6.4.6 Sample Preservation and Handling

Samples will be preserved in the field by placing the samples into an insulated cooler containing double-bagged wet ice immediately after sample collection. Upon receipt of the samples, authorized laboratory personnel will store and/or prepare the samples for analysis, taking into consideration the sample holding time.