DRAFT-OWNER REVIEW

Technical Memorandum No. 1 for
Town of Peshtigo, Wisconsin

Long-Term Water Supply Alternatives

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SECTION 1
INTRODUCTION

1.01 PURPOSE AND SCOPE

The Town of Peshtigo, Wisconsin (Town) has requested Strand Associates, Inc.® (Strand) to prepare the following report to analyze four drinking water supply alternatives. This request is in response to a contamination of per- and poly-fluoroalkyl substances (PFAS) discovered in the groundwater supply resulting from aqueous film-forming foams (AFFF), produced by Johnson Controls and Tyco Fire Products LP (Tyco), that was tested in nearby areas and has since infiltrated into the groundwater. This contamination has been sampled in several residential private groundwater wells throughout the Town at levels currently above the Wisconsin recommended level. The Wisconsin Department of Natural Resources (WDNR) recommends groundwater levels of perfluorooctanoic acid (PFOA) and Perfluorooctane Sulfonate (PFOS) to be less than 20 parts per trillion (ppt). The Town has been proactive in determining an alternative to provide affected residents safe drinking water.

The Town has identified four alternative sources for drinking water including:

Alternative No. 1–Town of Peshtigo municipal groundwater supply and treatment plant
Alternative No. 2–Town of Peshtigo municipal surface water supply and treatment plant
Alternative No. 3–City of Peshtigo municipal supply as retail customers
Alternative No. 4–City of Peshtigo supply as wholesale customer and Town of Peshtigo municipal water system

The scope of the analysis includes presenting a comparison of the costs, feasibility, and effectiveness of each water supply alternative. It also includes creating a decision matrix with input from the Town to determine the preferred alternative.

1.02 EXISTING DOCUMENTATION

A. *Remedial Action Options Report for Long-Term Drinking Water Supply, Town of Peshtigo, Wisconsin Summary Report* Arcadis U.S., Inc, May 2019

Arcadis US, Inc. (Arcadis) was hired on behalf of Johnson Controls and Tyco Fire Products LP in response to the WDNR requiring an investigation of the site and the PFAS contamination. The purpose of the report was to complete an interim evaluation of remedial action to provide long-term drinking water supply alternatives. The report concludes with the recommended solution for the Town to obtain water from the City of Marinette with an extension of the water distribution system. Since the report was completed, the City of Marinette has chosen not to supply the Town with water.

B. *Evaluation of Options for Long-Term Drinking Water Supply,* Cedar Corporation, December 2019

A report completed by Cedar Corporation, on behalf of the Town, was prepared to further evaluate available water supply sources and to incorporate the Town's interests. One of the alternatives included drilling private deep bedrock wells with special casings to extend below the PFAS contamination at each residence. Another alternative included a connection to a municipal water supply from the City of Peshtigo. The report recommends connecting a new Town municipal water distribution system to the City, served as a wholesale customer, by a single supply line fed by a booster station.

C. Bureau for Remediation and Redevelopment Tracking System (BRRTS) Project Number

The WDNR assigned the contamination a number in the BRRTS. The Environmental Cleanup & Brownfields Redevelopment BRRTS project number is 02-38-580694. The title for this project is JCI/TYCO FTC (PFAS). The project can be viewed on the WDNR BRRTS Web site to access correspondence and pertinent material dating back to January 9, 2018, when this project was initially logged.

1.03 ABBREVIATIONS AND DEFINITIONS

µg/L	micrograms per liter
AFFF	Aqueous film-forming foams
Arcadis	Arcadis U.S., Inc.
BRRTS	Bureau for Remediation and Redevelopment Tracking System
City	City of Peshtigo, Wisconsin
CY	Cubic Yards
ES	effective storage
F	fire flow
FIB/L	fiber per liter
fps	feet per second
ft	feet
FTC	Fire Technology Center
FWC	firm well capacity
gal	Gallon
gpcd	Gallons per capita per day
gpd	Gallons per Day
gpm	Gallons per minute
HI	Hazard Index
in	inch
JCI	Johnson Controls, Inc.
MCL	maximum contaminant level
MD	Maximum Demand
mg/L	milligrams per liter
MGD	Million gallons per day
NA	Not Available
ND	Non-Detect
OTA	Outdoor Testing/Training Area
PFAS	Per- and Poly-fluoroalkyl Substances
PFOA	Perfluorooctanoic acid
PFOS	Perfluorooctane Sulfonate
POET	Point of Entry Treatment
ppt	parts per trillion
R	reserve
SC	spare capacity
sq ft	square feet
Strand	Strand Associates Inc.®

SU	standard units
Town	Town of Peshtigo, Wisconsin
Tyco	Tyco Fire Products, LP
USEPA	United States Environment Protection Agency
WAC	Wisconsin Administrative Code
WDNR	Wisconsin Department of Natural Resources
WDOA	Wisconsin Department of Administration
WTP	Water Treatment Plant
WWTP	Wastewater Treatment Plant

SECTION 2
CURRENT CONDITIONS AND STUDY AREA CHARACTERISTICS

2.01 PROJECT LOCATION

The project is located within the Town in Marinette County, Wisconsin. The Town is in the northeastern portion of the state and borders the southwest edge of the City of Marinette, Wisconsin. The Town surrounds the entire City of Peshtigo (City) city limits. The project is also located on the western shore of the Green Bay of Lake Michigan. Figure 2.01-1 shows the project location. The contamination focus area is located primarily in the eastern side of the Town, east of the City.

2.02 PROJECT LIMITS

A. Phases

The project area is divided into several phases based on contamination sampling in private drinking water supply wells and the entire Town limits. These areas are shown in Figure 2.02-1.

Phase 1A incorporates the areas that were sampled in the initial sampling area delineated by Tyco Fire Products (Tyco). Figure 2.02-2 presents the boundary of Phase 1A, which incorporates an area of approximately 1.3 square miles and includes the locations of the sampled private wells.

Phase 1B incorporates the areas within the Class Action Settlement boundary that will be funded by Tyco in the Class Settlement but outside of Phase 1A. Figure 2.02-2 presents the boundary of Phase 1B, which incorporates an area of approximately 1.6 square miles. This area contains a portion of the wells sampled by the WDNR in the expanded sampling.

Phase 2 incorporates the remaining areas that were sampled that were not located in Phase 1B as directed by the WDNR. This area is located west and south of Phase 1B and incorporates an area of approximately 7.8 square miles. The limits of Phase 2 are presented in Figure 2.02-3 and also includes the locations of the sampled private wells. Phases 1A, 1B, and 2 contain all known positive sample detections of PFAS in private groundwater wells.

Phase 3 incorporates the area of the Town west and south of Phases 1 and 2 that is considered the ultimate buildout of areas around the contamination. This area has yet to be tested for PFAS in residential private wells but should be considered at risk for contamination. Phase 3 is presented in Figure 2.02-4.

2.03 HISTORICAL PRIVATE WATER WELL CONTAMINATION RESULTS

A. Recommended Wisconsin PFAS Threshold Levels

The WDNR and Wisconsin Department of health Services are currently recommending a threshold of 20 ppt of combined PFOA and PFOS in groundwater sources. PFOA and PFOS are substances that classify as PFAS. The USEPA's health advisory level for PFOA and PFOS in exposure at 70 ppt. These health advisory levels are nonenforceable and nonregulatory but offer a margin of protection for human health. According to the USEPA, exposure levels above 70 ppt can have adverse effects on the consumer's health. For the purposes of this report, the WDNR recommended threshold levels are used in this report.

Legend

- County Boundary
- Municipal Limits

T. PORTERFIELD

C. Marinette

C. Peshtigo

T. GROVER

T. PESHTIGO

Marinette County
Oconto County

T. LITTLE RIVER

PESHTIGO HARBOR STATE WILDLIFE AREA

N
W E
S

0 0.25 0.5 1
Miles

STRAND ASSOCIATES®

FIGURE 2.01-1
4756.002

PROJECT LOCATION

LONG TERM WATER SUPPLY ALTERNATIVES
TOWN OF PESHTIGO
MARINETTE COUNTY, WISCONSIN

DRAFT-OWNER REVIEW

Legend

- Municipal Limits
- Phase 1A - JCI / Tyco Investigation Area
- Phase 1B - JCI / Tyco Class Action Settlement Boundary
- Phase 2 - WDNR Expanded Investigation Area
- Phase 3 - Town Ultimate Buildout

T. PORTERFIELD

C. Marinette

C. Peshtigo

T. PESHTIGO

State Highway 64

US Highway 41

County Road B

Schachtka

Esri, HERE, Garmin, (c) OpenStreetMap contributors

N W E S

0 0.25 0.5 1 Miles

THREE PHASES OF INVESTIGATION

LONG TERM WATER SUPPLY ALTERNATIVES

TOWN OF PESHTIGO

MARINETTE COUNTY, WISCONSIN

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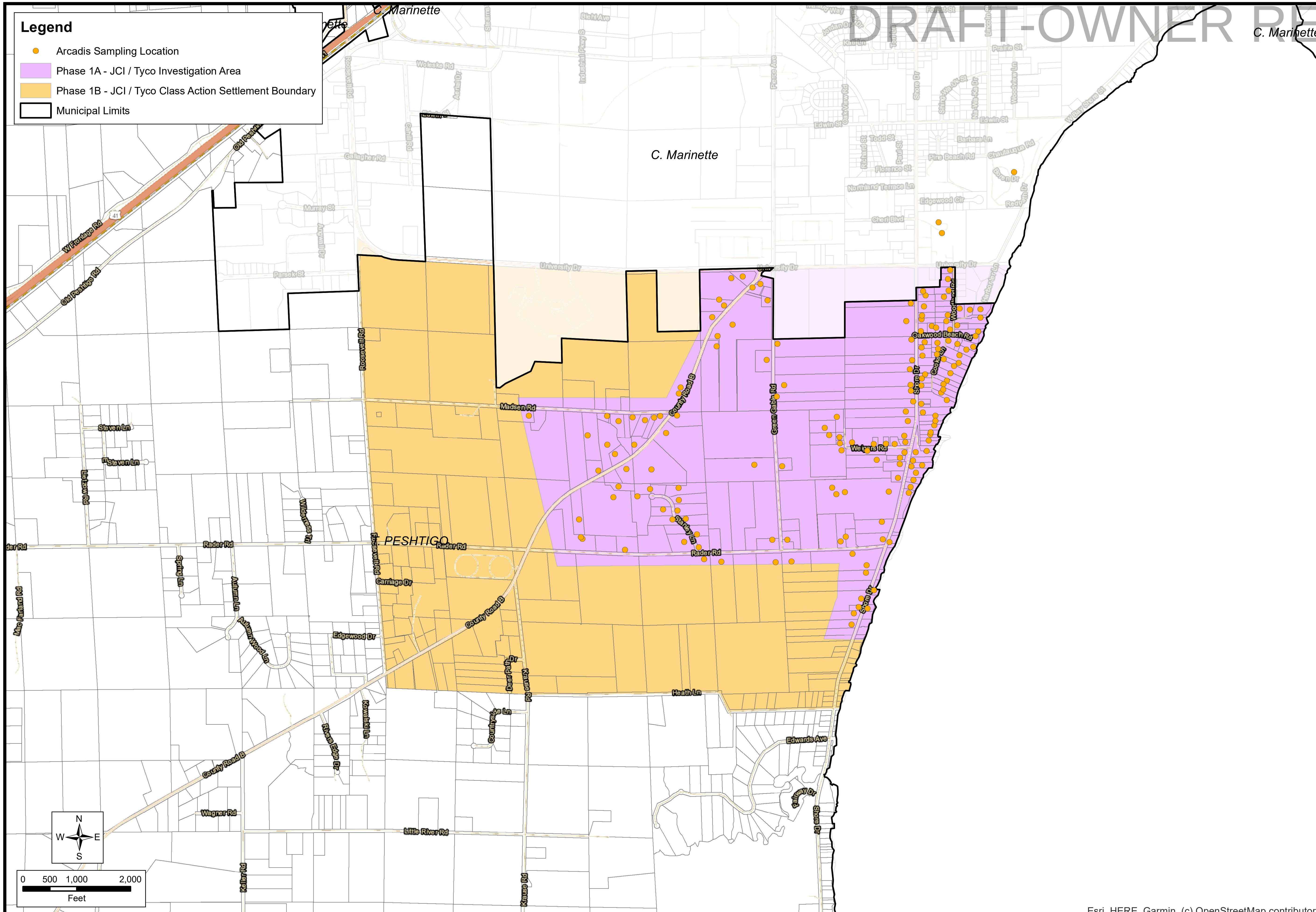
FIGURE 2.02-1

4756.002

Path: \\strand.com\projects\MAD\4700--4799\4756\002\Drawings\GIS\Report Figures\Fig 2.02-1 Three Phases of Design 11x17.mxd User: jasoni Date: 12/31/2021 Time: 8:38:57 AM



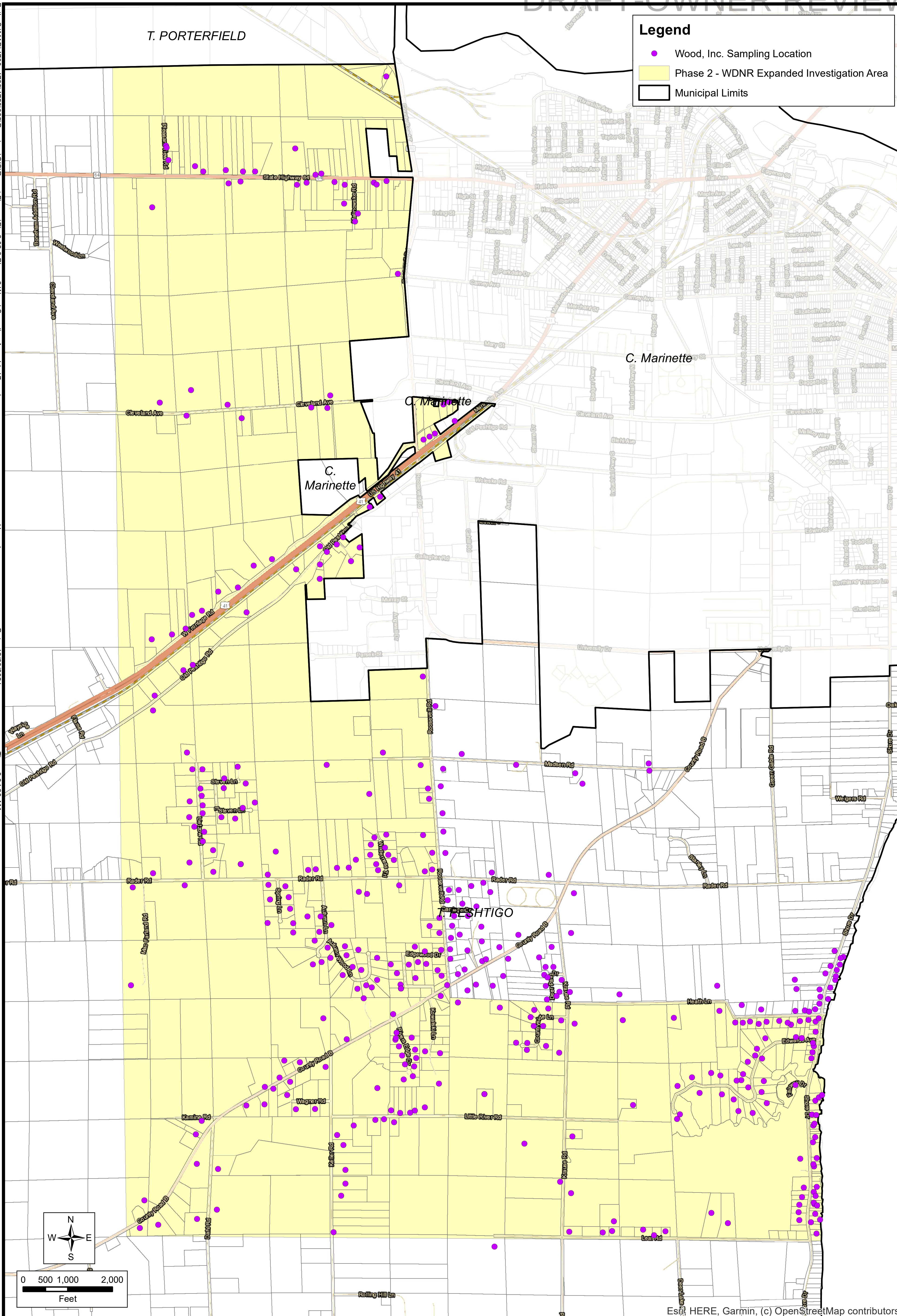
PHASE 1 - TYCO/ARCADIS SAMPLING AREA

LONG TERM WATER SUPPLY ALTERNATIVES
TOWN OF PESHTIGO
MARINETTE COUNTY, WISCONSIN

STRAND ASSOCIATES®

FIGURE 2.02-2
4756.002

Path: S:\MAD\4700--4799\4756\002\Drawings\GIS\Report Figures\Fig 2.02-2 Phase 1 Arcadis Sampling Area 11x17.mxd User: danc Date: 12/30/2021 Time: 8:32:32 AM



PHASE 2 - WDNR/WOOD SAMPLING AREA

LONG TERM WATER SUPPLY ALTERNATIVES
TOWN OF PESHTIGO
MARINETTE COUNTY, WISCONSIN

FIGURE 2.02-3
4756.002

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Legend

- Wood, Inc. Sampling Location
- Arcadis Sampling Location
- Phase 3 - Town Ultimate Buildout
- Municipal Limits

T. PORTERFIELD

C. Marinette

C. Peshtigo

T. GROVER

T. PESHTIGO

T. LITTLE RIVER

State Highway 64

County Road B

US Highway 41

N W E S

0 0.25 0.5 1 Miles

Esri, HERE, Garmin, (c) OpenStreetMap contributors

PHASE 3 - TOWN OF PESHTIGO ULTIMATE BUILDOUT

LONG TERM WATER SUPPLY ALTERNATIVES
TOWN OF PESHTIGO
MARINETTE COUNTY, WISCONSIN

STRAND ASSOCIATES®

FIGURE 2.02-4
4756.002

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B. Tyco Sample Area

Phase 1A study area was sampled by Arcadis US, Inc. on behalf of Tyco. Arcadis conducted Point of Entry Treatment (POET) system monitoring. Monitoring was completed quarterly. The monitoring began in February 2018 for wells with PFOA and PFOS levels over USEPA lifetime Health Advisory Levels. The monitoring expanded in July 2018 to all wells with PFOA and PFOS detection over laboratory response levels. Overall, there were 171 potable wells monitored. Table 2.03-1 presents the results of the Arcadis sampling over the last four years. Of the 171 wells sampled, 60 wells in Phase 1A were positive for PFOA/PFOS.

	Winter 2017 to 2018	Spring 2018	Summer 2018	Fall 2018	Winter 2019	Spring 2019	Summer 2019	Fall 2019	Winter 2019
USEPA Method	537	537	537.1	537.1	537.1	537.1	537.1	537.1	537.1
Number of Compounds	6	6	14	14	14	14	14	14	14
ND or <RL	100	108	104	110	112	112	111	111	111
< HAL	29	37	40	42	42	NA	NA	NA	NA
RL or < 20 ng/L	NA	NA	NA	NA	NA	28	29	28	28
20 ng/L to <70 ng/L	NA	NA	NA	NA	NA	14	13	14	14
>HAL	11	13	15	16	17	17	18	18	18
Total	140	158	159	168	171	171	171	171	171

Source: Arcadis Report

Note: NA=Not Available
**nanograms per liter (ng/L)=parts per trillion (ppt)

Table 2.03-1 Category Summary by Sampling Event in Phase 1A

C. WDNR Sample Area

Phase 1B and Phase 2 study area encapsulates the wells sampled by an engineering consultant, Wood PLC (Wood), on behalf of the WDNR. The data provided by Wood uses a Hazard Index (HI) scale to describe the severity of the contamination in the sampled well as recommended by the WDNR. The equation for HI is the sum of the observed concentrations divided by the recommended public health enforcement standard. As described in the Phase 1B and 2 sampling effort, HI values greater than 1 are cause for concern. If it is less than 1, it is unlikely that significant additive or toxic interactions would occur. There can also be a 0 value which is considered a nondetect. Table 2.03-2 presents the hazard index of PFAS sampling for each well in the Phase 1B and 2.

Non Detect	HI<1	HI≥1	Total Number of Wells
101	286	26	413

Source: Wood PLC

Table 2.03-2 Hazard Index of Wells in Phases 1B and 2 (2020 to 2021)

2.04 POPULATION ESTIMATES AND PROJECTIONS

Population data was collected from the U.S. Census Bureau for historical reference pertaining to the population changes in the Town. Since the census is conducted every ten years, the data is presented in increments of ten years starting from 1970. The data points between these ten-year increments are linear interpolations. The latest census information indicates the Town's 2020 population is 4,006.

The Town's population trends over the last 50 years vary from decade to decade. From 1970 to 1980, there was a 20.8 percent increase in population, followed by a 0.1 percent decrease in population from 1980 to 1990. Then, the population grew again with a 6.7 percent and 5.9 percent increase in populations in 1990 to 2000 and 2000 to 2010, respectively. The last decade, 2010 to 2020, has yielded another decrease in population of 1.3 percent.

Projections of the Town's population over the next 20 years were presented by the Wisconsin Department of Administration (WDOA). In the Marinette County Comprehensive Plan by the WDOA and Bay-Lake Regional Planning Commission (BLRPC), the Town is projected to grow in population to 4,419 in 2025 and to 4,473 in 2030. In 2013, the WDOA published another projection for the Town as *Minor Civil Division and Municipal Household Projections, 2010 - 2040*. In this projection, the population is projected to reach 4,555 in 2030 and to 4,524 in 2040. The 2013 estimate from the WDOA is 2 percent higher than the Marinette County Comprehensive Plan and projects further into the future. In order to provide a conservative demand estimate, the highest population projection of 4,555 from the WDOA was used.

Figure 2.04-1 presents the U.S. Census historical data and the projections for the population of the Town. The Census data is presented with the interpolation between the ten year census data collection years. The three additional lines indicate estimates in population over time and future projections.

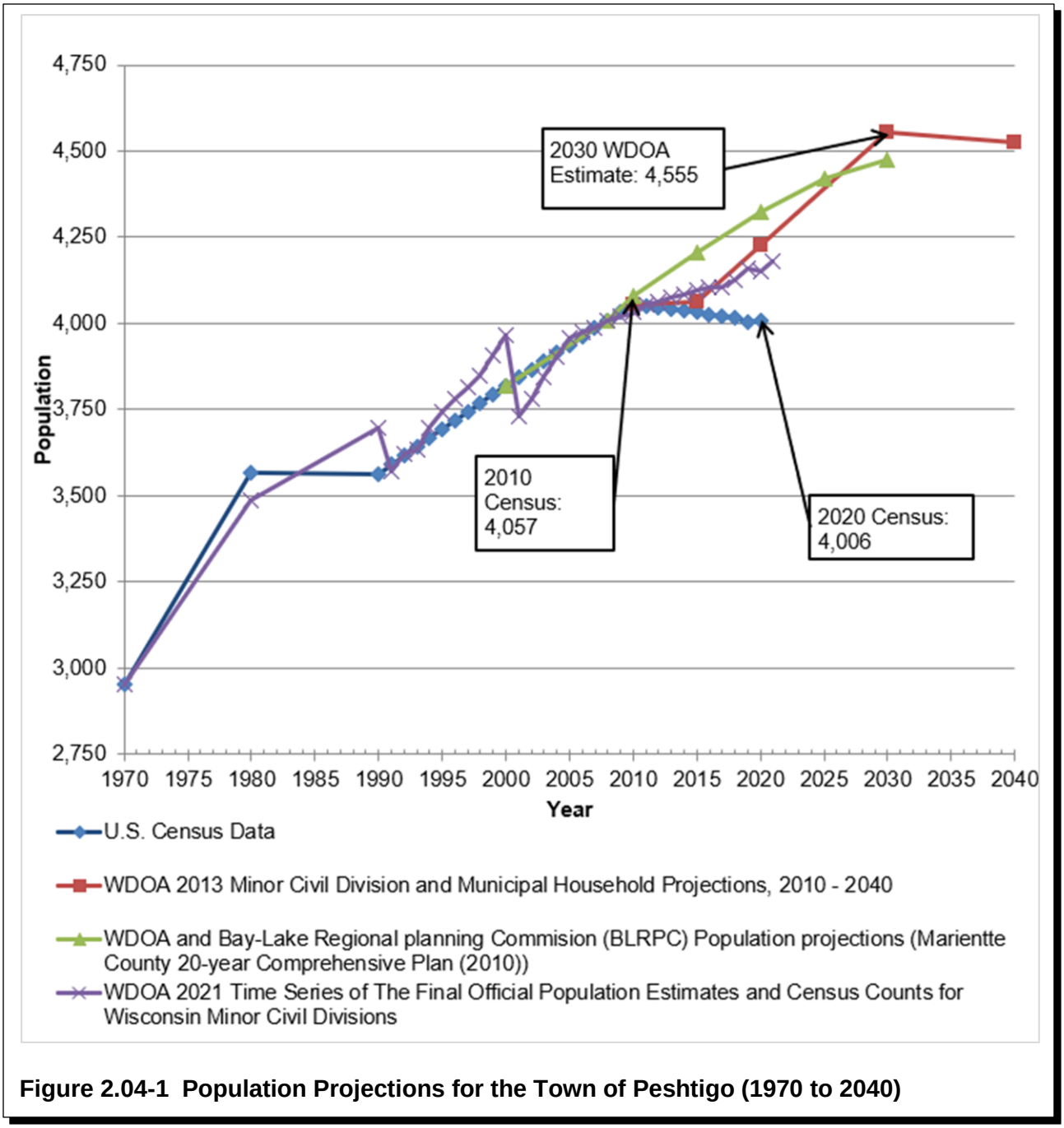

Figure 2.04-1 Population Projections for the Town of Peshtigo (1970 to 2040)

For each phase, parcel data was used to determine the population. Residential and commercial (business) parcels were primarily used for counting. To calculate the population in each phase, the U.S. Census data for the Town's population in 2020 of 4,006 people was divided by the total number of residential parcels in the Town to determine the average number of residents per household. The result was an average of 1.53 people per household. This is 0.8 people per household less than the WDOA estimated value for this parameter. Table 2.04-1 presents the number of parcels in each phase, the number of impacted parcels (sampled wells having a PFAS detect), and the estimated population based on the average for the Town.

Phase	Business Parcels		Residential and Agricultural Parcels		Population Based on Parcels	
	Positive Detection Wells	Total in Phase Area	Positive Detection Wells	Total in Phase Area	Positive Detection Wells	Total in Phase Area
1A	5	6	55	195	84	298
1B	4	8	52	134	80	205
1A + 1B	9	14	107	329	164	503
2	20	42	225	560	344	856
1A + 1B + 2	29	56	332	889	508	1,359
3	NA	65	NA	1,731	NA	2,647
1A + 1B + 2 + 3	NA	121	NA	2,620	NA	4,006

Source: U.S. Census Bureau

Note: The Phase 3 area has not been tested for PFAS/PFOA

Table 2.04-1 Town of Peshtigo Contaminated Wells and Total Population in Each Phase

2.05 WATER DEMANDS

Water demands for the Town were calculated based on the number of existing residential and commercial parcels and population located in the Phase 1A, Phase 1B, and Phase 2 areas of the Town. Demands for Phase 3 were calculated using the general population of the total Town population.

A. Average Daily Demand

The average daily residential demand was calculated for each Phase by multiplying the impacted population by the total water use using gallons per capita per day (gpcd) of 100 gpcd, which is based on an estimate by the United States Department of Agriculture. This also includes any additional water losses in the system outside of the water consumed. The water use estimate of 100 gpcd is slightly more than the per capita demand the City has averaged over the last ten years. The average household size of 1.53 people per house was multiplied by the average water use per capita to get the total residential water usage for each phase. From *Wastewater Engineering* (2013) by Metcalf and Eddy, an additional commercial demand was added based on the number of parcels by using an average of 13 gallons per business parcel per day. The projected 2021 average daily demand for Phases 1 and 2 are shown in Table 2.05-1.

Phase	Year	Businesses	Residents	Average Day Demand (gpd)	Average Day Demand (gpm)
1A	2021	6	298	29,894	21
1B	2021	8	205	20,593	14
1A + 1B	2021	14	503	50,487	35
2	2021	42	856	86,171	60
1A + 1B + 2	2021	56	1,359	136,657	95
1A + 1B + 2	2030	56	1,546	155,286	108

Source: U.S. Census Bureau, USDA

Notes: gpd=gallons per day; gpm=gallons per minute

Table 2.05-1 Town of Peshtigo Average Daily Demand Estimates

B. Maximum Daily Demand

The projected 2021 maximum day demands were estimated by multiplying a typical maximum to average day ratio of 2.5 to the 2021 average day demand. The demands are summarized in Table 2.05-2.

Phase	Year	Businesses	Residents	Maximum Day Demand (gpd)	Maximum Day Demand (gpm)
1A	2021	6	298	74,735	52
1B	2021	8	205	51,482	36
1A + 1B	2021	14	503	126,217	88
2	2021	42	856	215,427	150
1A + 1B + 2	2021	56	1,359	341,644	238
1A + 1B + 2	2030	56	1,546	388,213	270

Source: U.S. Census Bureau, USDA

Table 2.05-2 Town of Peshtigo Maximum Average Daily Demand

C. Phase 3 Demands

Phase 3 includes the population of the Town outside of Phase 1A, 1B, and 2 and is labeled the ultimate buildout in Section 2.02. The average daily demand for Phase 3 population in 2021 and estimated in 2030 are presented in Table 2.05-3.

Phase	Year	Businesses	Residents	Average Daily Demand (gpd)	Average Daily Demand (gpm)
3	2021	65	2,647	265,517	185
3	2030	65	3,009	301,788	210
1A + 1B + 2 + 3	2021	121	4,006	381,581	265
1A + 1B + 2 + 3	2030	121	4,555	433,673	302

Source: U.S. Census Bureau, USDA

Table 2.05-3 Town of Peshtigo Phase 3 Average Daily Demands

The maximum daily demand for Phase 3 population in 2021 and estimated in 2030 are presented in Table 2.05-4.

Phase	Year	Businesses	Residents	Maximum Daily Demand (gpd)	Maximum Daily Demand (gpm)
3	2021	65	2,647	663,791	461
3	2030	65	3,009	754,470	524
1A + 1B + 2 + 3	2021	121	4,006	953,951	663
1A + 1B + 2 + 3	2030	121	4,555	1,084,182	753

Source: U.S. Census Bureau, USDA

Table 2.05-4 Town of Peshtigo Phase 3 Maximum Daily Demands

2.06 REQUIRED CAPACITY

Days of maximum day demand can and do occur on several days in succession, especially during the warm summer months. As a result, water withdrawn from storage during any one maximum day must be replaced before the following day to ensure an adequate supply of water for the next day. Therefore, total demand on the maximum day determines the minimum amount of water that must be available the next day. It is recommended that the system be designed to meet maximum day domestic demands with the largest well out of service. The total amount of water that can be supplied with the largest well out of service is referred to as the firm capacity. If the firm capacity is less than the maximum day demand, storage will be depleted, and an inadequate amount of water may exist for the following day. Alternatively, if the firm capacity meets or exceeds the total demands, all storage facilities may be refilled during any 24-hour period and water will be available to meet the following potential maximum day demand.

A. Maximum Daily Demand

The Maximum Day Demand for the Class Action Settlement that impacted populations of Phases 1A and 1B was calculated as approximately 126,217 gpd (88 gpm). However, the demand should incorporate any additional future population that would be located in Phases 1A and 1B. Considering the WDOA population projections, the maximum day demand is 143,451 gpd, or 100 gpm.

The Maximum Day Demand for the current impacted population of Phases 1A, 1B, and 2 was calculated as approximately 341,642 gpd (238 gpm). However, the demand should incorporate any additional future population that would be located in Phases 1A, 1B, or 2. Considering the WDOA population projections, the maximum day demand is 388,213 gpd, or 270 gpm.

B. Maximum Daily Demand Plus Fire

Water supply requirements during a fire flow are based on the amount of water the Town should be able to supply on the maximum day. For a mostly residential area, a fire flow of 500 gpm for a duration of two hours will be used for calculation purposes. The projected 2030 maximum average daily demand plus fire flow for Phases 1A and 1B was calculated to be 193,451 gpd or 600 gpm during a fire. The projected 2030 maximum average daily demand plus fire flow for Phases 1A, 1B, and 2 was calculated to be 448,213 gpd or 770 gpm during a fire.

C. Supply

The WDNR conducts municipal drinking water system surveys every three years. Within these surveys is an assessment of the drinking water source supply capacity. WDNR uses the following criteria for determining adequate supply assuming both of the following conditions are met:

1. The maximum daily demand can be met with the largest source out of service while pumping 18 hours per day or less.
2. The average daily demand can be met with the largest source out of service while pumping 12 hours per day or less.

Also, in alignment with Wisconsin Administration Code (WAC) NR 811.26, the WDNR considers a groundwater system with only one source to not have adequate capacity due to lack of redundancy.

The firm well capacity to meet the WDNR requirements would be the maximum daily demand for Phases 1A, 1B, and 2 (270 gpm) with the largest well out of service while pumping 18 hours per day. Therefore, 270 gpm is divided by 18 hours and then multiplied by 24 hours in a day to calculate a firm well capacity of 360 gpm. In addition, 500 gpm of either supply or storage would be required for fire flow. To meet the requirements in WAC NR 811.26 and fire flow volume, the supply necessary would be 860 gpm.

D. Storage

According to WAC NR 811.62, elevated storage would be required because the service area is greater than 50 homes. In order determine the amount of elevated storage required, an effective storage calculation from the Wisconsin Water Association (2013) was used and is shown in Figure 2.06-1.

The maximum demand (MD) is the projected maximum day in 2030. The fire flow (F) is 500 gpm for 2 hours (T). The effective storage (ES) in gallons is needed to satisfy one maximum day demand with the largest well in the system is out of service. The equation was used to estimate the effective storage required. The spare capacity (SC) and reserve (R) were both 0 for this calculation. When the ES is calculated, an 80 percent effective storage factor is applied to the result to account for reserve and spare capacity. Firm well capacity (FWC) was 360 gpm based on the requirements in WAC NR 811.26 and calculated in section 2.06C of this report. Using the values in Table 2.06-1, an effective storage volume for the tank was calculated to be 49,152 gallons. The additional 80 percent effective storage factor would be applied to the tower capacity to determine the capacity needed to be 61,500 gallons.

$$SC = FWC + \frac{ES}{T * 60} - F - \frac{(R + MD)}{24 * 60}$$

Figure 2.06-1 Effective Storage Calculation Equation

Factor	Variable	Value	Units
Spare Capacity	SC	0	gpm
Firm Well/Source Capacity	FWC	360	gpm
Effective Storage	ES	Solve	Gallons
Reserve	R	0	Gallons
Fire Demand Rate	F	500	gpm
Fire Demand Duration	T	2	Hours
Maximum Day Demand	MD	388,213	Gallons

Source: Wisconsin Water Association (Spring 2013)

Table 2.06-1 Spare Storage Capacity Equation Components (Phases 1A, 1B, and 2)

NR 811.62 also describes the requirements for volume and pressure of storage facilities of drinking water systems. The code requires sufficient storage in an elevated storage tank, equal to an average day supply when only one pump is available under normal operating conditions. For the year of 2030, the storage capacity based on the sum of the average day demand is 155,286 gallons for Phases 1A, 1B, and 2. Applying the same 80 percent effective storage factor, the storage capacity to meet the requirements of NR 811.62 would be 194,108 gallons. If the tower is sized for only Phases 1A and 1B, the tower would be for an average daily demand of 57,381 gallons. With the effective storage factored in, the storage needed would be 71,727 gallons, or a 100,000-gallon tank for Phase 1A and 1B. This would be the supply volume used for sizing the tower since it is larger than the result of the spare

capacity equation in Figure 2.06-1. If the Town expands the distribution system past Phases 1A and 1B, additional storage would be needed.

2.07 AVAILABLE WATER SUPPLY

A. Groundwater Aquifer

Groundwater is a viable source based on usage in surrounding communities. The City and other neighboring communities currently source their water supply from groundwater aquifers. A geologic survey for Marinette County presents the groundwater aquifers as a sufficient source of drinking water. The shallow groundwater aquifers are recharged from the northwest precipitation runoff and flow towards the Green Bay. In the survey, groundwater is available throughout the county in the shallow sand and gravel aquifer. However, the bedrock aquifer is primarily available in the southeastern edge of the county near the Green Bay. For the Town, groundwater is predominately available in the deep sandstone aquifer,. Table 2.07-1 displays water quality parameters from a raw water sample taken from a comparable deep aquifer well at the City of Oconto, a neighboring community.

Sample Name	MCL	Units	Results	Units
Alkalinity, total		mg//L	mg//L	mg//L
Aluminum		mg//L	1.5	mg//L
Antimony, total	0.006	mg//L	0	mg//L
Arsenic	0.01	mg//L	0	mg//L
Asbestos	7 Million	FIB/L	0	FIB/L
Barium	2	mg//L	0.032	mg//L
Beryllium, total	0.004	mg//L	9.00E-05	mg//L
Cadmium	0.005	mg/L	0	mg//L
Calcium		mg/L	78	mg//L
Chlorine		mg/L	6.9	mg//L
Chromium	0.1	mg/L	0.0084	mg//L
Copper		µg/L	21	µg/L
Cyanide	0.2	mg/L	0	mg//L
Fluoride	4	mg/L	0.07	mg//L
Hardness, total		mg/L	340	mg//L
Iron		mg/L	2	mg//L
Lead		µg/L	0.9	µg/L
Magnesium		mg/L	39	mg//L
Manganese		mg/L	97	µg/L
Mercury	0.002	mg/L	0.00016	mg//L
Nickel	0.1	mg/L	0.0048	mg//L
Nitrate (NO_3-N)	10	mg/L	4.4	mg//L
Nitrate-Nitrite (NO_3+NO_2)	10	mg/L	4.4	mg//L
Nitrite (NO_2-N)	1	mg/L	0	mg//L
PH		SU	7.42	SU
Selenium	0.05	mg/L	0	mg//L
Silver		mg/L	0	µg/L
Sodium		mg/L	3.9	mg//L
Sulfate		mg/L	7.6	mg//L
Thallium	0.002	mg/L	0.00071	mg//L
Total Dissolved Solids		mg/L	350	mg//L

Notes: mg/L=milligrams per liter; µg/L=micrograms per liter; MCL=maximum contaminant level; FIB/L=fiber per liter

Table 2.07-1 Representative Groundwater Quality Parameters

The topsoil in this region of the county is fine grain lake deposit material, such as silt and sand. Below that layer consists of a mixture of shale, dolomite/limestone, and sandstones. The shallow wells in this region use water from the sand and gravel layers starting generally at 10 to 85 feet below ground surface. These wells are replenished with precipitation and directly discharge into Green Bay. This water is an ample source, but because the contamination of PFAS was found in the wells using this aquifer, the Town has decided to explore other supply sources.

From top to bottom, this formation would consist of the Maquoketa shale, Sinnipee Group (Galena-Platteville-Decorah) dolomite, St. Peter sandstone, and Prairie du Chien Dolomite. Then, the soils become primarily sandstones, with some streaks of dolomite and shale. As a groundwater source, this formation typically has excellent well yields (estimated yield of 500 gpm or greater), especially in the

lower portions which contain less dolomite. Due to this characteristic, the Cambrian Sandstones have become the primary producer of municipal water throughout northeast Wisconsin. This formation also has drawbacks in that there are typically zones high in radioactivity and the water usually has elevated levels of iron and hardness. The lowest level consists of granite and is essentially impermeable to water. According to the survey, this causes a high permeability rate for groundwater and a raised water table, in this case starting 20 to 50 feet below surface. Table 2.07-2 describes the expected geology based on the geological survey.

	Anticipated Depth to Formation		
Formation	**From (ft)**	**To (ft)**	**Thickness (ft)**
Glacial Deposits	0	150	150
Galena, Decorah, and Platteville	150	300	125
Prairie du Chien Group	300	575	275
Sandstone and Dolomite	575	Sea Level	225

Source: Department of the Interior U.S. Geologic Survey (1973)

Table 2.07-2 Approximate Depth and Thickness of Formations

B. Surface Water

The City of Marinette, directly north of the Town, uses surface water from the Green Bay as its source for drinking water. Green Bay is part of Lake Michigan with more than 15,000 square miles that drain into the bay with the Fox River being the largest tributary.

The Green Bay has varying water quality throughout. In the southern portion, water quality is impacted by shallow depths and muddy beds. Additionally, discharge from industrial and agricultural processes in the southern portion of the Green Bay causes contamination of synthetic and volatile organics. The turbidity of the water tends to clear further north as the water depth increases and further from the shore as the bed becomes rock. Additionally, the strong winds can impact water quality throughout the Green Bay in a matter of hours by churning up lake sediments.

Parameters of concern for Green Bay's water quality are monitored by the City of Marinette and are listed in Table 2.07-3 for reference. The PFAS/PFOA data is updated on the City Web site and indicates that the surface water levels are below WDNR standards of 20 ppt.

Parameter	Minimum	Maximum	Average	Units	Frequency	Period
Turbidity	0.4	4.96	0.983	NTU	Daily	2014 to 2021
Total Suspended Solids	NA					
Total Organic Carbon	2.5	13	4.5	mg/L	Monthly	May 2015 to Present
Color	Results are influenced by the Addition of PAC					4 hours
Alkalinity	96	122	110	mg/L as CaCO3	Daily	12 Months
Hardness	Not Conducted on Surface Water					
Bromide	Not Conducted on Surface Water					
pH	7.3	8.3	8	SU	Daily	12 Months
Taste/Odor	No Data					
Heavy Metals	Not Conducted on Surface Water					
Volatile Organics	Not Conducted on Surface Water					
Synthetic Organics	Not Conducted on Surface Water					
Inorganics	Not Conducted on Surface Water					
Radiological Parameters	Not Conducted on Surface Water					
PFAS/PFOA	1.16	3.54	2.00	ppt	Quarterly	November 2017 to Present

Notes: NTU=Nephelometric Turbidity Unit; $CaCO_3$=Calcium Carbonate; SU=standard units

Table 2.07-3 Marinette Water Utility Source Water Parameters

The City of Marinette collects raw water from the intake cribs and uses flocculation, sedimentation, and membrane filtration before the water is stored and distributed to meet its average demand of 2.9 MGD. Sampling of the treated entry point is presented in Table 2.07-4. Surface water from the Green Bay treated using comparable treatment processes is a viable source of supply for the Town.

Sample Name	MCL	Units	Results	Units
Alkalinity, Total			110	mg/L
Antimony, Total	0.006	mg/L	0	mg/L
Arsenic	0.01	mg/L	0	mg/L
Barium	2	mg/L	0.018	mg/L
Beryllium total	0.004	mg/L	0	mg/L
Cadmium	0.005	mg/L	0	mg/L
Calcium			33	mg/L
Chloride			11	mg/L
Chromium	0.1	mg/L	0	mg/L
Fluoride	4	mg/L	0.1	mg/L
Hardness, Total ($CaCO_3$)			130	mg/L
Iron			0.023	mg/L
Manganese			0.0064	mg/L
Mercury	0.002	mg/L	0	mg/L
Nickel	0.1	mg/L	0.0015	mg/L
Nitrate-nitrite (NO_3+NO_2)	10	mg/L	0.14	mg/L
Nitrite (NO_2-N)	1	mg/L	0.022	mg/L
pH			8.2	SU
Selenium	0.05	mg/L	0	mg/L
Sodium			6.7	mg/L
Sulfate			16	mg/L
Thallium total	0.002	mg/L	0	mg/L
Zinc			0	mg/L

Source: WDNR Marinette Waterworks (43803958) (June 16, 1998)

Table 2.07-4 Water Quality Entry Point Samples and Maximum Contaminant Levels (Marinette Waterworks)

C. City

1. Capacity

The City currently pumps drinking water supply from the deep sandstone groundwater aquifer. The City uses three water supply well stations and two elevated water storage tanks with approximately 450,000 total gallons of storage. The wells are labeled Nos. 2, 3, and 4. Table 2.07-5 displays the details of each well.

Well No.	Wisconsin Unique Well No.	Construction Date	Pumping Rate (gpm)	Casing Diameter (inches)	Pumping Level (feet)	Depth (feet)
2	BG346	01/01/1959	450	18	219	695
3	RL254	01/06/2005	500	20	243	650
4	VL961	04/05/2006	470	24	175	720

Source: WDNR Groundwater Retrieval Network

Table 2.07-5 City of Peshtigo Well Descriptions

The spare capacity of the City's water system is estimated using the same methods shown in Figure 2.06-1. For the City, effective storage is assumed to be 80 percent of the 450,000 gallons of total elevated water storage. Using the equation and values in Table 2.07-6, the spare capacity is estimated to be 1,484 gpm.

Factor	Variable	Value	Units
Spare Capacity	SC	Solve	gpm
Firm Well (or source) Capacity	FWC	920	gpm
Effective Storage	ES	360,000/250	Gallons/gpm
Reserve	R	0	Gallons
Fire Demand Rate	F	2,000	gpm
Fire Demand Duration	T	2	Hours
Maximum Day Demand (2020)	MD	629,000/437	Gallons/gpm

Source: Wisconsin Water Association (Spring 2013)

Table 2.07-6 Spare Storage Capacity Equation Components

The raw water supply for the City and quantity of treated water distributed per month in 2020 is presented in Table 2.07-7. Based on reports filed with the Public Service Commission of Wisconsin (PSCW), the maximum day demand for 2020 was the result of water main flushing that led to a one day high of 629,000 gallons, or 437 gpm. After the maximum demand amount is subtracted from the spare capacity (1,484 gpm), there is an excess capacity of 1,047 gpm available for current use and future growth. The Town's maximum demand was calculated to be 270 gpm for the 889 new customers requiring new service. This will result in an excess of 777 gpm for future buildout.

Month	Raw Water Pumped (gallons)	Entering Distribution system (gallons)	Average Daily Demand (gpd)	Average Daily Demand (gpm)
January	7,457,000	7,310,000	235,806	164
February	7,850,000	7,649,000	263,759	183
March	6,905,000	6,733,000	217,194	151
April	6,503,000	6,366,000	212,200	147
May	8,035,000	7,853,000	253,323	176
June	7,683,000	7,480,000	249,333	173
July	8,500,000	8,305,000	267,903	186
August	8,380,000	8,189,000	264,161	183
September	6,584,000	6,436,000	214,533	149
October	6,271,000	6,121,000	197,452	137
November	5,817,000	5,688,000	189,600	132
December	6,132,000	6,000,000	193,548	134
Total	86,117,000	84,130,000	230,335	160

Source: PSCW 2020 Annual Report

Table 2.07-7 City of Peshtigo 2020 Monthly Water Demand

2. Water Quality

The raw water is treated at each of the City's groundwater treatment facilities using a hydrous manganese oxide filtration system. This treatment process was selected due to the levels of radionuclides from the groundwater aquifers (Radium-226, Radium-228) and the levels of iron and manganese. The WDNR maximum contaminant levels (MCLs) for these contaminants are listed in Table 2.07-8. The table also presents the finished water quality sampling data for the parameters of interest for this report. From the table, the samples that are above MCL for the WDNR are Radium-226 and Radium-228. After treatment, the finished water meets all required sampling parameters. Groundwater treated using a similar technology is a viable source of supply for the Town.

Table 2.07-8 Water Quality Samples and Maximum Contaminant Levels

Radioactivity and Inorganics Samples	MCL	Units	Results Range	Units
Gross Alpha, excluding Radon & Uranium	15	pci/L	0.915 to 11.9	pci/L
Gross Alpha, including Radon & Uranium			0 to 12	pci/L
Radium-226	5	pci/L	0 to 5.49	pci/L
Radium-228	5	pci/L	0 to 6.02	pci/L
Radium, (226 + 228)	5	pci/L	0 to 9.77	pci/L
Combined Uranium	30	µg/L	0	µg/L
Alkalinity, Total			120 to 190	mg/L
Aluminum			0	mg/L
Antimony Total	0.006	mg/L	0	mg/L
Arsenic	0.01	mg/L	0	mg/L
Barium	2	mg/L	0.02 to 0.046	mg/L
Beryllium total	0.004	mg/L	0	mg/L
Cadmium	0.005	mg/L	0	mg/L
Calcium			35 to 54	mg/L
Chloride			11 to 40	mg/L
Chromium	0.1	mg/L	0	mg/L
Fluoride	4	mg/L	0.37 to 0.75	mg/L
Hardness, total ($CaCO_3$)			160 to 230	mg/L
Iron			0.0083 to 0.015	mg/L
Magnesium			18 to 24	mg/L
Manganese			0	mg/L
Mercury	0.002	mg/L	0	mg/L
Nickel	0.1	mg/L	0 to 0.00086	mg/L
Nitrate-Nitrite (NO_3+NO_2)	10	mg/L	0 to 0.064	mg/L
Nitrite (NO_2-N)	1	mg/L	0	mg/L
Ph			7.66 to 7.87	SU
Residue, Total, Filtered (TDS)			150 to 310	mg/L
Selenium	0.05	mg/L	0	mg/L
Silver			0 to 0.35	mg/L
Sodium			9.1 to 26	mg/L
Thallium Total	0.002	mg/L	0	mg/L
Zinc			0	mg/L

Source: WDNR Peshtigo Waterworks (43804420) (July 2017 to September 2021)

Note: pci/L= pounds per cubic inch per liter; TDS=total dissolved solids

SECTION 3
DESCRIPTION OF ALTERNATIVES

3.01 GENERAL

This section describes the four water supply alternatives considered in this report. The alternatives are described based on the infrastructure needed to supply, treat, and pump water to the distribution system in the contaminated areas. Details and information related to the distribution system required to deliver the water supply to consumers, which pertains the same to each of the four alternatives, is summarized in a later section of the report.

The distribution system required for each of the four alternatives, which includes an elevated tank and approximately 37 miles of water main is shown in Section 3.06.

3.02 ALTERNATIVE 1–TOWN MUNICIPAL GROUNDWATER SUPPLY AND TREATMENT PLANTS

This alternative includes the Town constructing two deep-aquifer wells with treatment facilities at each well with sanitary sewer required to connect to the contaminated areas and waste discharges.

A. Design Criteria

As described in Section 2 of the report, two wells are required to provide adequate capacity. Radium treatment will likely be required based on representative wells nearby exhibiting combined radium levels that exceed the MCL. The wells and treatment equipment would be contained in a block and brick facility.

The wells would be designed in accordance with WAC NR 811.12. For the purposes of this report, a 16-inch-diameter finished well is assumed. A 16-inch-diameter casing would extend down 220 feet below grade. A 15-inch lower borehole would extend to approximately 680 feet below grade. Based on neighboring wells constructed of similar parameters, it is anticipated the wells would yield approximately 500 gpm each. The wells would pump from the aquifer, through the treatment equipment, and to the distribution system.

The treatment equipment would be designed in accordance with WAC NR 811.43. Five vertical pressure filtration vessels that contain a catalytic granular media, in addition to injection of hydrogenous manganese oxide, would be used to treat the groundwater and reduce the radium in the water to levels below the MCL. The filters would be backwashed occasionally to remove accumulated solids and would be settled out in a backwash tank below the treatment vessels. Backwash water and solids would be pumped from the treatment facility to a neighboring wastewater treatment plant (WWTP) for processing. For the purposes of this report, it was assumed the City's WWTP would be used.

Disinfection would be included in the form of either chlorine gas or liquid sodium hypochlorite. Corrosion inhibitor, in the form of a poly-orthophosphate blend, is included but should be evaluated further during design. All critical treatment components would be provided with redundancy.

B. Location

Preliminary well sites for the two wells are shown in Figure 3.02-1. The sites were sited primarily based on the extents of the PFAS plume as shown in the *Groundwater Flow and Solute Transport Model Report*

Legend

Phase Areas

Phase

- Phase 1A - JCI / Tyco Investigation Area
- Phase 1B - JCI / Tyco Class Action Settlement Boun
- Phase 2 - WDNR Expanded Investigation Area
- Phase 3 - Town Ultimate Buildout
- Proposed Water Main
- Municipal Limits

T. PORTERFIELD

C. Marinette

T. PESHTIGO

C. Peshtigo

1 Mile Radius

Proposed Sanitary Sewer Connection

Proposed Water Main Connection to Distribution System

Proposed Well No. 1

Proposed Sanitary Sewer Connection

Proposed Well No. 2

1 Mile Radius

N
W E
S

0 0.25 0.5 1
Miles

Esri, HERE, Garmin, (c) OpenStreetMap contributors

ALTERNATIVE 1- TOWN OF PESHTIGO GROUNDWATER TREATMENT PLANT

LONG TERM WATER SUPPLY ALTERNATIVES
TOWN OF PESHTIGO
MARINETTE COUNTY, WISCONSIN

STRAND ASSOCIATES®

FIGURE 3.02-1
4756.002

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by Arcadis and by the two existing sampling areas. An additional well siting study should be completed to identify other contaminated sites, setbacks, and other requirements as required in NR 811.12.

C. Environmental Impacts

Environmental impacts regarding the construction of two deep-aquifer wells with treatment include land acquisition and development of undisturbed land. Additional water main and sanitary sewer construction would likely take place in predisturbed locations and are not anticipated to have many environmental impacts. The waste product of filter media used for radium treatment will require special handling and disposal.

D. Future Growth Considerations (Phase 3)

As shown in Section 2.05, an additional daily 524 gpm would be needed to serve Phase 3. This alternative has surplus firm capacity to serve Phase 3 and no additional supply infrastructure would be needed.

E. Costs

Opinion of probable capital and operational costs for this alternative are shown in Table 3.02-1. Costs are shown in fourth quarter 2021 dollars. O&M costs were estimated based on scaled values from the City, with 20 percent included. Contingency and professional services for capital costs are estimated to be 20 percent and 15 percent of capital costs, respectively. Permitting, including environmental components of the project, are included in these percentage costs. The contingency and professional services are estimated to be 20 percent of annual costs because engineering services will not be required each year after the project is constructed. Based on the projection range for population from the WDNR in Section 2.05 of this report, 20 years was used for cost estimates. The 20-year total present cost of the alternative, which includes a 3 percent rate of return for the annual costs, is calculated to be $23,837,000 for Phase 2.

Facility	Capital Cost	Annual Cost	20-Year Total Present Cost
Well No. 1 Drilling	$426,000	$0	$426,000
Well No. 1 Treatment Facility	$1,500,000	$0	$1,500,000
Well No. 1 Water Main Connection	2,960,000	$0	$2,960,000
Well No. 1 Sanitary Connection	$1,840,000	$0	$1,840,000
Well No. 1 Chemicals	$0	$2,000	$30,000
Well No. 1 Electrical	$0	$6,500	$97,000
Well No. 1 Backwash Waste	$0	$107,500	$1,600,000
Land Acquisition	$50,000	$0	$50,000
Well No. 2 Drilling	$426,000	$0	$426,000
Well No. 2 Treatment Facility	$1,500,000	$0	$1,500,000
Well No. 2 Water Main Connection	$3,520,000	$0	$3,520,000
Well No. 2 Sanitary Connection	$2,310,000	$0	$2,310,000
Well No. 2 Chemicals	$0	$2,000	$30,000
Well No. 2 Electrical	$0	$6,500	$97,000
Well No. 2 Backwash Waste	$0	$107,500	$1,600,000
Land Acquisition	$50,000	$0	$50,000
Subtotal	$14,582,000	$232,000	
Contingency and Professional Services	$5,104,000	$47,000	
Total	**$19,686,000**	**$279,000**	**$23,837,000**

Table 3.02-1 Alternative 1 Opinion of Probable Capital and Operational Costs

3.03 ALTERNATIVE 2–TOWN MUNICIPAL SURFACE WATER SUPPLY AND TREATMENT PLANT

This alternative includes the Town constructing a surface water treatment facility to treat water from the Green Bay, and the distribution main and sanitary sewer required to connect to the contaminated areas and waste discharges.

A. Design Criteria

The source water would be from Green Bay. In Section 2, the physical properties of this water body and the water quality parameters of concern were described. For the purpose of estimating capital costs, the system included for surface water treatment is the Trident® Treatment unit (Model TR-420A) as manufactured by WesTech. This equipment is in accordance with WAC NR 811.21 for quality treatment of surface water. This design involves using two treatment units with one train in use and one redundancy train. The treatment trains would be housed in a 50-foot by 50-foot facility and it would be constructed with block and brick.

The treatment system combines various chemical treatment solutions, including an MMAC Adsorption Clarifier® system, a Mixed Media Filter, and MULTIBLOCK® direct retention air/water backwash underdrain system. The system takes in raw water dosed with chemicals near the bottom of the tank and begins an upflow treatment process that combines flocculation and clarification. Water then flows over a weir into the mixed media filtration chamber. Finally, the flow is collected by the Multiblock® underdrain with Laser Shield™ media retainer before the treated water is ultimately pumped to the distribution system.

Each treatment train is designed for an intake flow of 700 gpm, meeting the requirements of WAC NR 811.21 for adequate capacity to provide ample water for future growth in demand and to allow for part time operation. In order to provide water to the WTP, an intake structure must be constructed into the bay. NR 811.21 states that intake locations must be at least 1,000 feet from all boat launching ramps, marinas, docks, or floating fishing piers which are accessible by the public and at least 1,000 feet from all WWTP effluent discharge locations. From the *Source Water Assessment for Marinette Utility*, to avoid heavy siltation areas and areas with muddy bed rock, the intake would also need to be placed off the shore to avoid high turbidity levels in the source water.

B. Location

The WTP is preliminary sited at the Little River Boat Launch across the street from the Little River Country Club. This location has sufficient space to house the equipment for the water treatment system. The shoreline in this area has reduced sedimentation closer to shore compared to areas north. In order to provide good raw water quality and sufficient depth, the intake location will be preliminarily sited approximately 2,000 linear feet east from the WTP to avoid high turbidity waters near the shore and ample distance from all docks. The location of the WTP is presented in Figure 3.03-1.

Wastewater discharged from the water treatment facility would need to be disposed of through effluent waste lines to a wastewater treatment facility. For the purposes of this report, the City's WWTP will be used. The sanitary sewer to deliver the waste product would likely run parallel to some of the proposed water distribution system. The waste line is assumed run north along Shore Road, then west along Rader Road, then north along Mac Farland Road, before ultimately following Old Peshtigo Road into the City for disposal. The waste line location is presented in Figure 3.03-1. Alternative methods for waste management, including waste treatment on-site, can be evaluated further for lower cost solutions.

C. Environmental Impacts

Environmental impacts regarding the construction of one water treatment facility include land acquisition and development of disturbed land. The anticipated dimensions of the water treatment facility are approximately 50 by 50 feet. Additional water main and sanitary sewer construction would likely take place in predisturbed locations and are not anticipated to have many environmental impacts.

D. Future Growth Considerations (Phase 3)

As shown in Section 2.05, an additional daily 524 gpm would be needed to serve Phase 3. This alternative has surplus firm capacity to serve Phase 3 and no additional supply infrastructure would be needed.

DRAFT OWNER REVIEW

Legend

Phase Areas

Phase

- Phase 1A - JCI / Tyco Investigation Area
- Phase 1B - JCI / Tyco Class Action Settlement Boun
- Phase 2 - WDNR Expanded Investigation Area
- Phase 3 - Town Ultimate Buildout
- Proposed Water Main
- Municipal Limits

T. PORTERFIELD

C. Marinette

T. PESHTIGO

C. Peshtigo

Proposed Sanitary Sewer Connection

Intake Line 2,000 Linear Feet into Green Bay

Proposed Water Treatment Facility

N
W E
S

0 0.25 0.5 1
Miles

Esri, HERE, Garmin, (c) OpenStreetMap contributors

ALTERNATIVE 2- TOWN OF PESHTIGO SURFACE WATER TREATMENT PLANT

LONG TERM WATER SUPPLY ALTERNATIVES
TOWN OF PESHTIGO
MARINETTE COUNTY, WISCONSIN

STRAND ASSOCIATES®

FIGURE 3.03-1
4756.002

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E. Costs

Opinion of probable capital and operational costs for this alternative are shown in Table 3.03-1. Costs are shown in fourth quarter 2021 dollars. O&M costs were estimated based on values from the City, with 20 percent included. Contingency and professional services for capital costs are estimated to be 20 percent and 15 percent of capital costs, respectively. Permitting, including environmental components of the project, are included in these percentage costs. The contingency and professional services are estimated to be 20 percent of annual costs because engineering services will not be required each year after the project is constructed. The 20-year total preset cost of the alternative is calculated to be $24,735,000 for Phase 2.

	Capital Cost	Annual Cost	20-Year Total Present Cost
Filtration Equipment	$765,000	$0	$765,000
Intake Screen	$100,000	$0	$50,000
Intake Pipe	$2,000,000	$0	$2,000,000
Sanitary Connection to City	$7,920,000	$0	$7,920,000
Water Treatment Facility	$1,250,000	$0	$1,250,000
Water Main Connection to Tower	$5,020,000	$0	$5,020,000
Process Pumps, Piping, and Fittings	$100,000	$0	$100,000
Backwash Tank	$200,000	$0	$200,000
Clearwell	$250,000	$0	$250,000
WTP Operation–Chemicals	$0	$14,000	$209,000
WTP Operation–Electricity	$0	$11,000	$164,000
WTP Maintenance	$0	$29,000	$432,000
Subtotal	$17,605,000	$54,000	
Contingency and Professional Services	$6,162,000	$11,000	
Total	**$23,767,000**	**$65,000**	**$24,735,000**

Table 3.03-1 Alternative 2 Opinion of Probable Capital and Operational Costs

3.04 ALTERNATIVE 3–CITY OF PESHTIGO–MUNICIPAL WATER SYSTEM EXTENSION

This alternative includes extending the City municipal water utility system to the contaminated areas within the Town and billing the Town as retail customers. The City would own the distribution system main, booster station, and elevated water storage tank and would sell water to each individual Town customer.

A. Design Criteria

For this water source alternative, one or more water main extensions would extend the City's water supply to serve customers in the Town's contamination area. The City would own and operate the extensions, distribution system, and booster pumping station. The Town residents would individually become customers of the City's municipal water utility.

The connection would serve the distribution system in Phase 1A, 1B, and 2. The system would require a connection to an existing water main in the City. This water main would continue 14,000 linear feet to the Phase 2 area. If the project were to bypass Phase 2 and only service the Phase 1A and 1B population, an additional 7,100 linear feet would be required to reach this area. All water mains were assumed to be 8- and 12-inch-diameter ductile iron. It is anticipated that the connections would add an additional 136,657 gpd, or 95 gpm of average day and 238 gpm of maximum day demand to the City's water utility.

A booster pumping station would be required to supply the required demand. The booster pumping station would be required for any of the phases for this alternative. To reach the furthest extents of the distribution system totaling 37 miles over an elevation change of 15 to 20 feet, a pumping station would be used to deliver water while optimizing the extension size. The pumping station would be designed in accordance with WAC NR 811.26. This includes housing at least two pumps that are each capable of meeting the demand.

B. Location

The preliminary location of the connection to the City's water supply and the booster pumping station are presented in Figure 3.04-1. The connection to the City municipal water utility is located on the southeast corner of the City on the south side of Maple Street and north of the railroad tracks. Final locations should be evaluated during design using a computerized hydraulic water system model.

C. Environmental Impacts

Impacts to the environment pertaining to this alternative would be the result of the excavation and installation of the ductile iron water main for the distribution system. The system would also require the construction of one booster pumping station along the line path. The impacts should be minimal with all pipeline and structure locations in predisturbed land.

D. Future Growth Considerations (Phase 3)

As shown in Section 2.05, an additional daily 524 gpm would be needed to serve Phase 3. In Section 2.07 the City was calculated to have an excess of 777 gpm for future buildout. Therefore, this alternative has surplus firm capacity to serve Phase 3 and no additional supply infrastructure would be needed.

E. Costs

Opinion of probable capital and operational costs for this alternative are shown in Table 3.04-1. Costs are shown in fourth quarter 2021 dollars. O&M costs were estimated based on values from the City, with 20 percent included. Contingency and professional services for capital costs are estimated to be 20 percent and 15 percent of capital costs, respectively. Permitting, including environmental components of the project, are included in these percentage costs. The contingency and professional services are estimated to be 20 percent of annual costs because engineering services will not be required each year after the project is constructed. The 20-year total preset cost of the alternative is calculated to be 11,604,000 for Phase 2.

Legend

Phase Areas

Phase

- Phase 1A - JCI / Tyco Investigation Area
- Phase 1B - JCI / Tyco Class Action Settlement Boun
- Phase 2 - WDNR Expanded Investigation Area
- Phase 3 - Town Ultimate Buildout
- Proposed Water Main
- Municipal Limits

T. PORTERFIELD

C. Marinette

C. Peshtigo

T. PESHTIGO

Preliminary Elevated Storage Tank Location

Preliminary Booster Station Location

N
W E
S

0 0.25 0.5 1
Miles

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ALTERNATIVE 3- CITY OF PESHTIGO SYSTEM EXTENSION

LONG TERM WATER SUPPLY ALTERNATIVES
TOWN OF PESHTIGO
MARINETTE COUNTY, WISCONSIN

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FIGURE 3.04-1
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	Capital Cost	Annual Cost	20-Year Total Present Cost
Water Main Connection (City to Town)	$4,870,000	$0	$4,870,000
Fire Hydrants	$280,000	$0	$280,000
Booster Pumping Station Facility	$300,000	$0	$300,000
Booster Pumps, Motors, and VFD	$75,000	$0	$75,000
Water Retail Sales	$0	$206,000	$3,065,000
O&M of Water Mains	$0	$22,000	$328,000
Land Acquisition	$50,000	$0	$50,000
Subtotal	$5,575,000	$228,000	
Contingency and Professional Services	$1,952,000	$46,000	
Total	**$7,527,000**	**$274,000**	**$11,604,000**

Note: VFD=Variable Frequency Drive

Table 3.04-1 Alternative 3 Opinion of Probable Capital and Operational Costs

3.05 ALTERNATIVE 4–CITY OF PESHTIGO –WHOLESALE–TOWN OF PESHTIGO MUNICIPAL SYSTEM

This water source alternative includes creating a Town water utility and constructing a wholesale connection from the City municipal water system to serve customers in the contaminated areas within the Town. Under this alternative, the City would bill the Town as a wholesale customer and the Town would own and operate the system. A booster station will likely be needed to supply water to the far edge of the Town.

A. Design Criteria

For this water supply alternative, a connection would be designed to connect to the City water system. The connection will be owned and operated by the Town. Therefore, the Town will be served as a wholesale customer to the City.

This alternative differs from the extension design in section 3.04 because the Town would own this entire distribution system. This includes the booster pumping station and all storage structures. The Town would also assume the responsibilities and cost of establishing a water utility for the wholesale water distribution. The distribution system design and connection would be the same as in Section 3.04, but the costs of construction, maintenance, and operation would be the responsibility of the Town. This differs from the extension alternative in Section 3.04 where the City would assume the costs and responsibilities for the system.

The majority of the infrastructure would be the same as the alternative in Section 3.04. The system would require a connection to an existing water main in the City. This water main would continue 14,000 linear feet to the Phase 2 area. If the project were to bypass Phase 2 and only service the Phase 1A and 1B population, an additional 7,100 linear feet would be required to reach this area. All water main are assumed to be 8- and 12-inc-diameter ductile iron pipe.

A booster pumping station would be required to supply the required demand whether in Phase 1A/1B or Phase 2. To reach the furthest extents of the distribution system totaling 37 miles over an elevation change of 15 to 20 feet, a pumping station would be used to deliver water while optimizing the extension size. The pumping station would be designed in accordance with WAC NR 811.26. This includes housing at least two pumps that are each capable of meeting the demand.

B. Location

Preliminary locations of the connection to the City's water supply and the booster pumping station are presented in Figure 3.05-1. Final locations should be evaluated during design using a computerized hydraulic water system model.

C. Environmental Impacts

Impacts to the environment pertaining to this design would be the result of the excavation and installation of the ductile iron water main for the distribution system. The system would also require the construction of one booster pumping station. The impacts are expected to be minimal with all pipeline and structure locations in predisturbed land.

D. Future Growth Considerations (Phase 3)

As shown in Section 2.05, an additional daily 524 gpm would be needed to serve Phase 3. In Section 2.07 the City was calculated to have an excess of 777 gpm for future buildout. Therefore, this alternative has surplus firm capacity to serve Phase 3 and no additional supply infrastructure would be needed.

E. Costs

Opinion of probable capital and operational costs for this alternative are shown in Table 3.05-1. Costs are shown in fourth quarter 2021 dollars. O&M costs were estimated based on values from the City, with 20 percent included. Contingency and professional services for capital costs are estimated to be 20 percent and 15 percent of capital costs, respectively. Permitting, including environmental components of the project, are included in these percentage costs. The contingency and professional services are estimated to be 20 percent of annual costs because engineering services will not be required each year after the project is constructed. The 20-year total preset cost of the alternative is calculated to be $12,303,000 for Phase 2.

Legend

Phase Areas

Phase

- Phase 1A - JCI / Tyco Investigation Area
- Phase 1B - JCI / Tyco Class Action Settlement Boun
- Phase 2 - WDNR Expanded Investigation Area
- Phase 3 - Town Ultimate Buildout
- Proposed Water Main
- Municipal Limits

T. PORTERFIELD

C. Marinette

C. Peshtigo

T. PESHTIGO

Preliminary Elevated Storage Tank Location

Preliminary Booster Station Location

N
W E
S

0 0.25 0.5 1
Miles

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ALTERNATIVE 4- CITY OF PESHTIGO WHOLESALE

LONG TERM WATER SUPPLY ALTERNATIVES

TOWN OF PESHTIGO

MARINETTE COUNTY, WISCONSIN

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FIGURE 3.05-1
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	Capital Cost	Annual Cost	20-Year Total Present Cost
Water Main Connection (City to Town)	$4,870,000	$0	$4,870,000
Fire Hydrants	$280,000	$0	$280,000
Booster Pumping Station Facility	$300,000	$0	$300,000
Booster Pumps, Motors, and VFD	$75,000	$0	$75,000
Wholesale Volume From the City of Peshtigo	$0	$245,000	$3,645,000
O&M of Water Mains	$0	$22,000	$328,000
Land Acquisition	$50,000	$0	$50,0000
Subtotal	$5,575,000	$267,000	
Contingency and Professional Services	$1,952,000	$54,000	
Total	**$7,527,000**	**$321,000**	**$12,303,000**

Table 3.05-1 Alternative 4 Opinion of Probable Capital and Operational Costs

3.06 DISTRIBUTION SYSTEM

A. Design Criteria

The distribution system for all four alternatives would be designed for the Phase 1A, 1B, and 2 populations. The water main that would deliver the alternative water source is assumed to be 8- and 12-inch-diameter ductile iron pipe. The total lengths of water main within Phase 1A, Phase 1B, and Phase 2 are presented in Table 3.06-1.

Phase	8-Inch-Diameter Pipe Length (Feet)	12-Inch-Diameter Pipe Length (Feet)	Total Length of Pipe (Feet)
1A	12,673	18,892	31,565
1B	7,516	18,147	25,663
1A + 1B	20,189	37,039	57,228
2	30,812	81,669	112,481
1A + 1B + 2	51,001	118,708	169,709
3 (connection)	0	24,336	24,336

Table 3.06-1 Distribution System Ductile Iron Pipe Linear Lengths

The distribution system design would also use an elevated water storage tank with a capacity of 100,000 gallons for Phase 1A and 1B or 200,000 gallons for Phases 1A, 1B, and 2, as described in section 2.05. Additionally, two tanks of 100,000 gallons can be constructed if the distribution system is constructed in phases at different times. These volumes would be sufficient capacities to meet the storage requirements of WAC NR 811.62. This design capacity also accommodates fire flow demand of 500 gpm for two hours. Alternatives 1, 2, and 4 will require elevated water storage tanks to meet WAC NR 811.62 supply requirements for systems serving 50 homes. Alternative 3 is recommended

to also incorporate an elevated storage tank due to the addition of more than 50 homes to the City's water system from a single water main connection.

The required storage also needs to meet minimum and maximum pressure requirements at ground level of 35 and 100 pounds per square inch (psi) respectively, and a fire flow pressure of 20 psi at 500 gpm. The elevated tank would require an overflow elevation placement to ensure that the distribution system would reach all locations with a pressure of at least 60 psi, as recommended for a commercial and residential area in *Water Supply & Pollution Control* (2008). Elevations throughout the project area range approximately 30 feet with the higher elevations typically found west/northwest near the City and the lower elevations typically found east towards the shore. The City has two elevated water towers with heights of 135 feet and 137 feet above grade. Therefore, a tower with a high-water level of 742 feet in elevation would meet recommended pressure levels for commercial and residential areas.

The elevated tower's preliminary general location is presented in Figure 3.07-1. The area recommended is the intersection of Roosevelt Road and Rader Road. This is located on the boundary of Phases 1B and 2. The location is central to the distribution system and within range for connections to a proposed 12-inch diameter water main. The central location will also aid in reducing water age in the system. Most of the properties near the intersection are privately owned and a cost for land allocation would need to be accounted for. Many of the properties are agricultural, which presents opportunities to purchase vacant land.

Fire hydrants will be placed between 350 to 600 feet apart on the distribution system, as required by WAC NR 811.71. An estimate for the number of fire hydrants was used of one fire hydrant every 475 feet of linear pipe in the distribution system. The assumption was made to use fire hydrants as opposed to flushing hydrants based on the nominal price difference and to accommodate the Town's requirements of fire flow.

B. Location

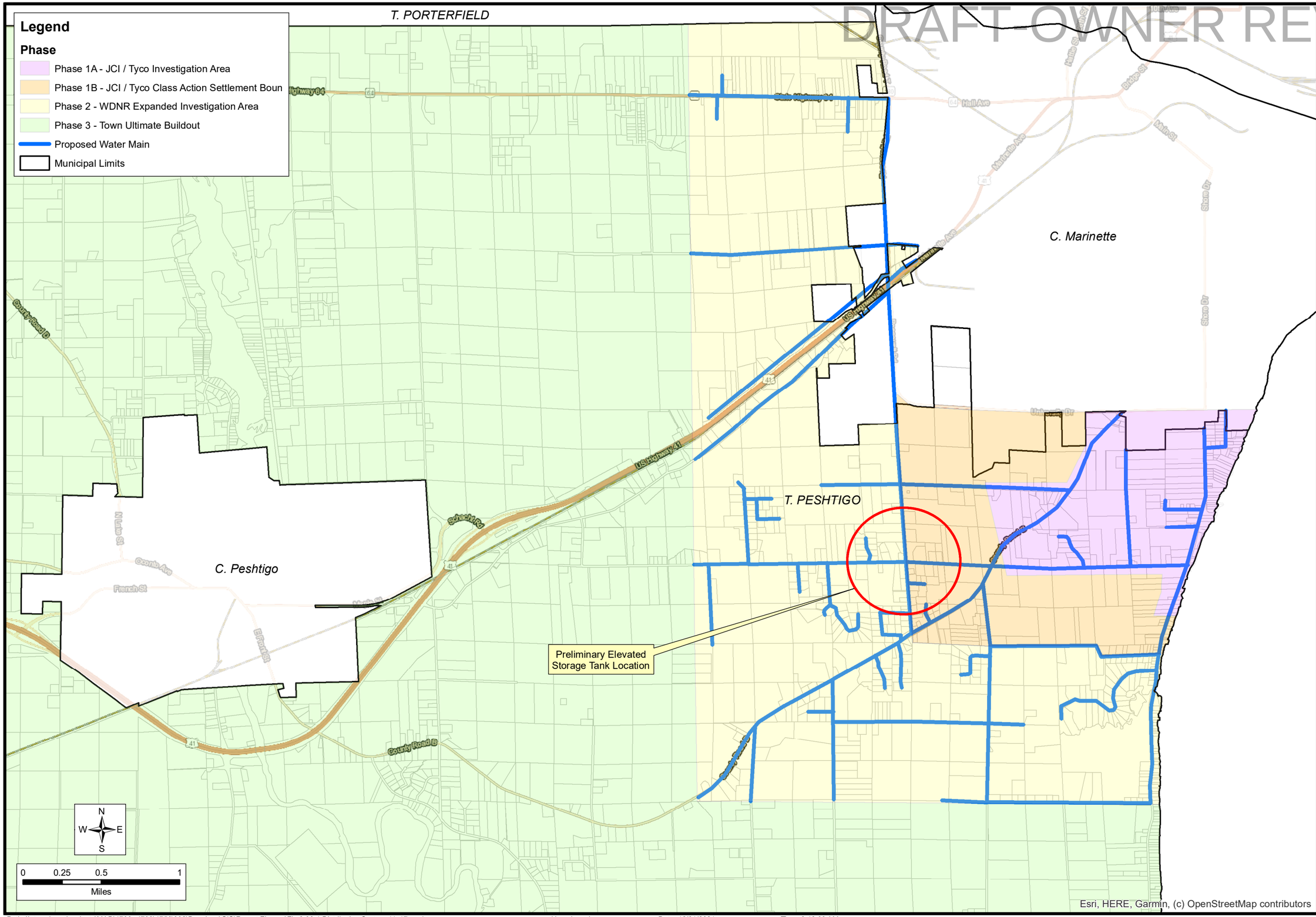
The preliminary location of the distribution system and elevated water storage tank are presented in Figure 3.06-1. Figure 3.07-1 presents all four alternatives on one map with the proposed distribution system.

C. Environmental Impacts

Possible impacts to the environment pertaining to this design would be the result of the excavation and installation of the ductile iron water main for the distribution system. The system would also require the land acquisition and construction of one booster pumping station and one elevated water storage tank. The impacts are expected to be minimal with all pipeline and infrastructure locations in predisturbed land.

D. Costs

Opinion of probable capital and operational costs for the distribution system for each phase are shown in Tables 3.06-2, 3.06-3, and 3.06-4. Costs are shown in fourth quarter 2021 dollars. O&M costs were estimated based on values from the City, with 20 percent included. Contingency and professional services for capital costs are estimated to be 20 percent and 15 percent of capital costs, respectively. Permitting,



DISTRIBUTION SYSTEM

LONG TERM WATER SUPPLY ALTERNATIVES

TOWN OF PESHTIGO

MARINETTE COUNTY, WISCONSIN

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FIGURE 3.06-1

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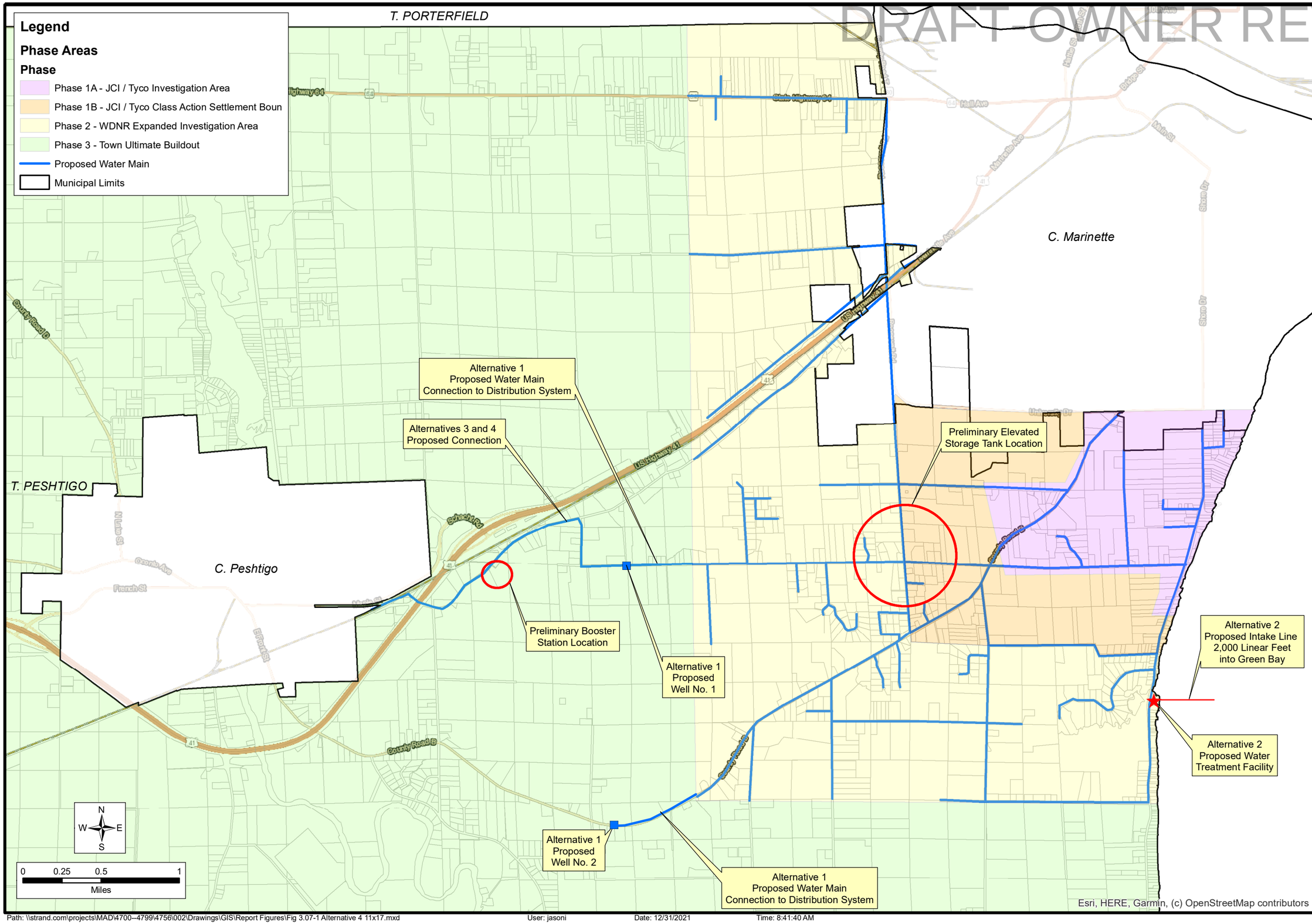

ALTERNATIVES 1, 2, 3, 4

LONG TERM WATER SUPPLY ALTERNATIVES
TOWN OF PESHTIGO
MARINETTE COUNTY, WISCONSIN

STRAND ASSOCIATES®

FIGURE 3.07-1
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including environmental components of the project, are included in these percentage costs. The contingency and professional services are estimated to be 20 percent of annual costs because engineering services will not be required each year after the project is constructed.

The cost of the distribution systems are $12,885,000 for Phase 1A only, $21,632,000 for Phase 1A and 1B, and $60,610,000 for Phase 1A, 1B, and 2.

	Capital Cost	Annual Cost	20-Year Total Present Cost
12-Inch Ductile Iron Water Main	$3,780,000	$0	$3,780,000
8-Inch Ductile Iron Water Main	$2,410,000	$0	$2,410,000
Fire Hydrant	$380,000	$0	$380,000
Private-Side Services and Meter Set	$975,000	$0	$975,000
Well Abandonments	$293,000	$0	$293,000
100,000 Gallon Elevated Water Storage Tank	$950,000	$25,000	$1,322,000
Operation and Maintenance	$0	$28,000	$417,000
Land Acquisition	$50,000	$0	$50,000
Subtotal	$8,838,000	$53,000	
Contingency and Professional Services	$3,094,000	$11,000	
Total	**$11,932,000**	**$64,000**	**$12,885,000**

Table 3.06-2 Distribution System Opinion of Probable Capital and Operational Costs (Phase 1A)

	Capital Cost	Annual Cost	20-Year Total Present Cost
12-Inch Ductile Iron Water Main	$3,630,000	$0	$3,630,000
8-Inch Ductile Iron Water Main	$1,430,000	$0	$1,430,000
Fire Hydrant	$300,000	$0	$300,000
Private-Side Services and Meter Set	$670,000	$0	$670,000
Well Abandonments	$201,000	$0	$201,000
O&M	$0	$23,000	$343,000
Subtotal	$6,231,000	$23,000	
Contingency and Professional Services	$2,181,000	$5,000	
Total	**$8,412,000**	**$28,000**	**$8,829,000**

Table 3.06-3 Distribution System Opinion of Probable Capital and Operational Costs (Phase 1B)

	Capital Cost	Annual Cost	20-Year Total Present Cost
12-Inch Ductile Iron Water Main	$16,340,000	$0	$16,340,000
8-Inch Ductile Iron Water Main	$5,860,000	$0	$5,860,000
Fire Hydrant	$1,280,000	$0	$1,280,000
Private-Side Services and Meter Set	$2,800,000	$0	$2,800,000
Well Abandonments	$840,000	$0	$840,000
Upgrade Elevated Water Tank to 200,000 Gallons	$400,000	$25,000	$772,000
O&M	$0	$100,000	$1,488,000
Subtotal	$27,520,000	$125,000	
Contingency and Professional Services	$9,631,000	$25,000	
Total	**$37,152,000**	**$150,000**	**$39,384,000**

Table 3.06-4 Distribution System Opinion of Probable Capital and Operational Costs (Phase 2)

APPENDIX A
OPINION OF PROBABLE COST

Table A-1 Opinion of Probable Cost for Phase 1A Only

Alternative 1–Groundwater Treatment Plant–Radium Only	Quantity	Units	Price Per	Capital Cost	Annual Cost	20-Year Total Present Cost
Well No. 1 Drilling For 16-Inch Finished Well	1	EA	$425,500.00	$426,000.00	$-	$426,000.00
Well No. 1 Radium Treatment Facility	1	EA	1,500,000.00	1,500,000.00	-	1,500,000.00
Well No. 1 12-Inch Ductile Iron Water Main Connection	9,500	LF	200.00	1,900,000.00	-	1,900,000.00
Well No. 1 Sanitary Connection	10,500	LF	175.00	1,840,000.00	-	1,840,000.00
Well No. 1 Chemicals	1	LS	500.00	-	500.00	8,000.00
Well No. 1 Electrical	1	LS	1,500.00	-	1,500.00	23,000.00
Well No. 1 Backwash Waste	1	LS	107,000.00	-	107,000.00	1,592,000.00
Land Acquisition	1	EA	50,000.00	50,000.00	-	50,000.00
Well No. 2 Drilling For 16-Inch Finished Well	1	EA	425,500.00	426,000.00	-	426,000.00
Well No. 2 Radium Treatment Facility	1	EA	1,500,000.00	1,500,000.00	-	1,500,000.00
Well No. 2 12-Inch Ductile Iron Water Main Connection	12,300	LF	200.00	2,460,000.00	-	2,460,000.00
Well No. 2 Sanitary Connection	13,200	LF	175.00	2,310,000.00	-	2,310,000.00
Well No. 2 Chemicals	1	LS	500.00	-	500.00	8,000.00
Well No. 2 Electrical	1	LS	1,500.00	-	1,500.00	23,000.00
Well No. 2 Backwash Waste	1	LS	107,000.00	-	107,000.00	1,592,000.00
Land Acquisition	1	EA	50,000.00	50,000.00	-	50,000.00
Subtotal				**$12,462,000.00**	**$218,000.00**	
Contingency and Professional Services				**$4,362,000.00**	**$44,000.00**	
Total				**$16,824,000.00**	**$262,000.00**	**$20,722,000.00**

Notes: EA=each; LF=linear feet; LS=lump sum

Alternative 2–Surface Water Treatment	Quantity	Units	Price Per	Capital Cost	Annual Cost	20-Year Total Present Cost
Filtration Equipment–Two Trident® Treatment Units, Model TR-420A	1	LS	$765,000.00	$765,000.00	$-	$765,000.00
Intake Screen	1	EA	100,000.00	100,000.00	-	100,000.00
8-Inch Intake Pipe	2,000	EA	1,000.00	2,000,000.00	-	2,000,000.00
Sanitary Connection to City	36,000	LF	220.00	7,920,000.00	-	7,920,000.00
12-Inch Ductile Iron Water Main Connection	14,500	LF	200.00	2,900,000.00	-	2,900,000.00
Water Treatment Facility	2,500	SQ FT	500.00	1,250,000.00	-	1,250,000.00
Process Pumps, Piping, and Fittings Including Pumps for Raw Water, High Service, and Backwash	1	LS	100,000.00	100,000.00	-	100,000.00
Backwash Tank	1	EA	200,000.00	200,000.00	-	200,000.00
Clearwell (Concrete, Fitted for 25,000 Gallons)	1	EA	250,000.00	250,000.00	-	250,000.00
Water Treatment Plant (WTP) Operation–Chemicals (Based on City of Marinette Chemical Treatment Costs and Town's Demand)	1	LS	3,000.00	-	4,000.00	60,000.00
WTP Operation–Electricity (Based on City of Marinette Power for Treatment Costs and Town's Demand)	1	LS	2,000.00	-	3,000.00	45,000.00
WTP Maintenance (Based on City of Marinette Maintenance Costs and Town's Demand)	1	LS	6,000.00	-	8,000.00	120,000.00
Land Acquisition	0	EA	50,000.00	-	-	–
Subtotal				**$15,485,000.00**	**$15,000.00**	
Contingency and Professional Services				**$5,420,000.00**	**$3,000.00**	
Total				**$20,905,000.00**	**$18,000.00**	**$21,173,000.00**

Note: SQ FT=square feet

Alternative 3–City of Peshtigo Water System Extensions (Retail)	Quantity	Units	Price Per	Capital Cost	Annual Cost	20-Year Total Present Cost
12-Inch Ductile Iron Water Main Connection (City to Town)	24,336	LF	$200.00	$4,870,000.00	$-	$4,870,000.00
Fire Hydrants (One every 475 Feet According to Wisconsin Administrative Code Department of Natural Resources [WAC WDNR])	51	EA	5,400.00	280,000.00	-	280,000.00
Booster Pumping Station Facility	1	EA	300,000.00	300,000.00	-	300,000.00
Booster Pumps, Motors, and Variable Frequency Drives (VFD)	1	EA	75,000.00	75,000.00	-	75,000.00
Water Retail Sales Based on City of Peshtigo Water Treatment Process Costs and Town's Demand	1	LS	38,000.00	-	46,000.00	685,000.00
Operation & Maintenance (O&M) Based on City of Peshtigo Transmission Costs and Alternative Design	24,336	LF	0.74	-	22,000.00	328,000.00
Land Acquisition (Booster Station)	1	EA	50,000.00	50,000.00	-	50,000.00
Subtotal				**$5,575,000.00**	**$68,000.00**	
Contingency and Professional Services				**$1,952,000.00**	**$14,000.00**	
Total				**$7,527,000.00**	**$82,000.00**	**$8,747,000.00**

Alternative 4–City of Peshtigo Water System Wholesale	Quantity	Units	Price Per	Capital Cost	Annual Cost	20-Year Total Present Cost
12-Inch Ductile Iron Water Main Connection (City to Town)	24,336	LF	$200.00	$4,870,000.00	$-	$4,870,000.00
Fire Hydrants (1 Every 475 Feet According to WAC NR)	51	EA	5,400.00	280,000.00	-	280,000.00
Booster Pumping Station Facility	1	EA	300,000.00	300,000.00	-	300,000.00
Booster Pumps, Motors, and VFD	1	EA	75,000.00	75,000.00	-	75,000.00
Quarterly Wholesale Volume from the City of Peshtigo	4	LS	12,000.00	-	58,000.00	863,000.00
O&M Based on City of Peshtigo Transmission Costs and Alternative Design	24,336	LF	0.74	-	22,000.00	328,000.00
Land Acquisition (Booster Station)	1	EA	50,000.00	50,000.00	-	50,000.00
Subtotal				**$5,575,000.00**	**$80,000.00**	
Contingency and Professional Services				**$1,952,000.00**	**$16,000.00**	
Total				**$7,527,000.00**	**$96,000.00**	**$8,956,000.00**

Note: SQ FT=square feet

Distribution System Only–Phase 1A	Quantity	Units	Price Per	Capital Cost	Annual Cost	20-Year Total Present Cost
12-Inch Ductile Iron Water Main	18,892	LF	$200.00	$3,780,000.00	$-	$3,780,000.00
8-Inch Ductile Iron Water Main	12,673	LF	190.00	2,410,000.00	-	2,410,000.00
Fire Hydrants (One Every 475 Feet According to WAC NR)	70	EA	5,400.00	380,000.00	-	380,000.00
100,000 Gallon Elevated Water Storage Tank	1	EA	950,000.00	950,000.00	25,000.00	1,322,000.00
Private-Side Services and Meter Set	195	EA	5,000.00	975,000.00	0.00	975,000.00
Abandonment of Contaminated Wells	195	EA	1,500.00	293,000.00	0.00	293,000.00
O&M Based on City of Peshtigo Transmission Costs and Alternative Design	31,565	LF	0.74	-	28,000.00	417,000.00
Land Acquisition (Elevated Water Tank)	1	EA	50,000.00	50,000.00	-	50,000.00
Subtotal				**$8,838,000.00**	**$53,000.00**	
Contingency and Professional Services				**$3,094,000.00**	**$11,000.00**	
Total				**$11,932,000.00**	**$64,000.00**	**$12,885,000.00**

						Phase 1A
Alternative 1–20-Year Total with Distribution System						$33,607,000.00
Alternative 2–20-Year Total with Distribution System						$34,058,000.00
Alternative 3–20-Year Total with Distribution System						$21,632,000.00
Alternative 4–20-Year Total with Distribution System						$21,841,000.00

Table A-2 Opinion of Probable Cost for Phase 1A and 1B

Alternative 1–Groundwater Treatment Plant–Radium Only	Quantity	Units	Price Per	Capital Cost	Annual Cost	20-Year Total Present Cost
Well No. 1 Drilling For 16-Inch Finished Well	1	EA	$425,500.00	$426,000.00	$-	$426,000.00
Well No. 1 Radium Treatment Facility	1	EA	1,500,000.00	1,500,000.00	-	1,500,000.00
Well No. 1 12-Inch Ductile Iron Water Main Connection	11,250	LF	200.00	2,250,000.00	-	2,250,000.00
Well No. 1 Sanitary Connection	10,500	LF	175.00	1,840,000.00	-	1,840,000.00
Well No. 1 Chemicals	1	LS	1,000.00	-	1,000.00	15,000.00
Well No. 1 Electrical	1	LS	2,500.00	-	2,500.00	38,000.00
Well No. 1 Backwash Waste	1	LS	107,000.00	-	107,000.00	1,592,000.00
Land Acquisition	1	EA	50,000.00	50,000.00	-	50,000.00
					-	
Well No. 2 Drilling For 16-Inch Finished Well	1	EA	425,500.00	426,000.00	-	426,000.00
Well No. 2 Radium Treatment Facility	1	EA	1,500,000.00	1,500,000.00	-	1,500,000.00
Well No. 2 12-Inch Ductile Iron Water Main Connection	14,050	LF	200.00	2,810,000.00	-	2,810,000.00
Well No. 2 Sanitary Connection	13,200	LF	175.00	2,310,000.00	-	2,310,000.00
Well No. 2 Chemicals	1	LS	1,000.00	-	1,000.00	15,000.00
Well No. 2 Electrical	1	LS	2,500.00	-	2,500.00	38,000.00
Well No. 2 Backwash Waste	1	LS	107,000.00	-	107,000.00	1,592,000.00
Land Acquisition	1	EA	50,000.00	50,000.00	-	50,000.00
Subtotal				**$13,162,000.00**	**$221,000.00**	
Contingency and Professional Services				**$4,607,000.00**	**$45,000.00**	
Total				**$17,769,000.00**	**$266,000.00**	**$21,727,000.00**

Alternative 2–Surface Water Treatment	Quantity	Units	Price Per	Capital Cost	Annual Cost	20-Year Total Present Cost
Filtration Equipment–Two Trident® Treatment Units, Model TR-420A	1	LS	$765,000.00	$765,000.00	$-	$765,000.00
Intake Screen	1	EA	100,000.00	100,000.00	-	100,000.00
8-Inch Intake Pipe	2,000	EA	1,000.00	2,000,000.00	-	2,000,000.00
Sanitary Connection to City	36,000	LF	220.00	7,920,000.00	-	7,920,000.00
12-Inch Ductile Iron Water Main Connection	18,000	LF	200.00	3,600,000.00	-	3,600,000.00
Water Treatment Facility	2,500	SQ FT	500.00	1,250,000.00	-	1,250,000.00
Process Pumps, Piping, and Fittings including Pumps for Raw Water, High Service, and Backwash	1	LS	100,000.00	100,000.00	-	100,000.00
Backwash Tank	1	EA	200,000.00	200,000.00	-	200,000.00
Clearwell (Concrete, Fitted for 25,000 Gallons)	1	EA	250,000.00	250,000.00	-	250,000.00
WTP Operation–Chemicals (Based on City of Marinette Chemical Treatment Costs and Town's Demand)	1	LS	5,000.00	-	6,000.00	90,000.00
WTP Operation–Electricity (Based on City of Marinette Power for Treatment Costs and Town's Demand)	1	LS	4,000.00	-	5,000.00	75,000.00
WTP Maintenance (Based on City of Marinette Maintenance Costs and Town's Demand)	1	LS	9,000.00	-	11,000.00	164,000.00
Land Acquisition	0	EA	50,000.00	-	-	-
Subtotal				**$16,185,000.00**	**$22,000.00**	
Contingency and Professional Services				**$5,665,000.00**	**$5,000.00**	
Total				**$21,850,000.00**	**$27,000.00**	**$22,252,000.00**

Alternative 3–City of Peshtigo Water System Extensions (Retail)	Quantity	Units	Price Per	Capital Cost	Annual Cost	20-Year Total Present Cost
12-Inch Ductile Iron Water Main Connection (City to Town)	24,336	LF	$200.00	$4,870,000.00	$-	$4,870,000.00
Fire Hydrants (One Every 475 Feet According to WAC NR)	51	EA	5,400.00	280,000.00	-	280,000.00
Booster Pump Station Facility	1	EA	300,000.00	300,000.00	-	300,000.00
Booster Pumps, Motors, and VFD	1	EA	75,000.00	75,000.00	-	75,000.00
Water Retail Sales Based on City of Peshtigo Water Treatment Process Costs and Towns Demand	1	LS	63,000.00	-	76,000.00	1,131,000.00
O&M Based on City of Peshtigo Transmission Costs and Alternative Design	24,336	LF	0.74	-	22,000.00	328,000.00
Land Acquisition (Booster Station)	1	EA	50,000.00	50,000.00	-	50,000.00
Subtotal				**$5,575,000.00**	**$114,000.00**	
Contingency and Professional Services				**$1,952,000.00**	**$23,000.00**	
Total				**$7,527,000.00**	**$137,000.00**	**$9,566,000.00**

Alternative No. 4 City of Peshtigo Water System Wholesale	Quantity	Units	Price Per	Capital Cost	Annual Cost	20-Year Total Present Cost
12-Inch Ductile Iron Water Main Connection (City to Town)	20,836	LF	$200.00	$4,170,000.00	$-	$4,170,000.00
Fire Hydrants (One Every 475 Feet According to WAC NR)	44	EA	5,400.00	240,000.00	-	240,000.00
Booster Pumping Station Facility	1	EA	300,000.00	300,000.00	-	300,000.00
Booster Pumps, Motors, and VFD	1	EA	75,000.00	75,000.00	-	75,000.00
Quarterly Wholesale Volume from the City of Peshtigo	4	LS	19,000.00	-	92,000.00	1,369,000.00
O&M Based on City of Peshtigo Transmission Costs and Alternative Design	20,836	LF	0.74	-	19,000.00	283,000.00
Land Acquisition (Booster Station)	1	EA	50,000.00	50,000.00	-	50,000.00
Subtotal				**$4,835,000.00**	**$111,000.00**	
Contingency and Professional Services				**$1,693,000.00**	**$23,000.00**	
Total				**$6,528,000.00**	**$134,000.00**	**$8,522,000.00**

Distribution System Only–Phase 1A	Quantity	Units	Price Per	Capital Cost	Annual Cost	20-Year Total Present Cost
12-Inch Ductile Iron Water Main	18,892	LF	$200.00	$3,780,000.00	$-	$3,780,000.00
8-Inch Ductile Iron Water Main	12,673	LF	190.00	2,410,000.00	-	2,410,000.00
Fire Hydrants (One Every 475 Feet According to WAC NR)	70	EA	5,400.00	380,000.00	-	380,000.00
100,000-Gallon Elevated Water Storage Tank	1	EA	950,000.00	950,000.00	25,000.00	1,322,000.00
Private-Side Services and Meter Set	195	EA	5,000.00	975,000.00	-	975,000.00
Abandonment of Contaminated Wells	195	EA	1,500.00	293,000.00	-	293,000.00
O&M Based on City of Peshtigo Transmission Costs and Alternative Design	31,565	LF	0.74	-	28,000.00	417,000.00
Land Acquisition	1	EA	50,000.00	50,000.00	-	50,000.00
Subtotal				**$8,838,000.00**	**$53,000.00**	
Contingency and Professional Services				**$3,094,000.00**	**$11,000.00**	
Total				**$11,932,000.00**	**$64,000.00**	**$12,885,000.00**

Distribution System Only–Phase 1B	Quantity	Units	Price Per	Capital Cost	Annual Cost	20-Year Total Present Cost
12-Inch Ductile Iron Water Main	18,147	LF	$200.00	$ 3,630,000.00	$-	$3,630,000.00
8-Inch Ductile Iron Water Main	7,516	LF	190.00	1,430,000.00	-	1,430,000.00
Fire Hydrants (One Every 475 Feet According to WAC NR)	54	EA	5,400.00	300,000.00	-	300,000.00
Private-Side Services and Meter Set	134	EA	5,000.00	670,000.00	-	670,000.00
Abandonment of Contaminated Wells	134	EA	1,500.00	201,000.00	-	201,000.00
O&M Based on City of Peshtigo Transmission Costs and Alternative Design	25,663	LF	0.74	-	23,000.00	343,000.00
Land Acquisition	0	EA	50,000.00	-		-
Subtotal				**$6,231,000.00**	**$23,000.00**	
Contingency and Professional Services				**$2,181,000.00**	**$5,000.00**	
Total				**$ 8,412,000.00**	**$28,000.00**	**$8,829,000.00**

Distribution System Only–Phase 1A and 1B	Quantity	Units	Price Per	Capital Cost	Annual Cost	20-Year Total Present Cost
12-Inch Ductile Iron Water Main	37,039	LF	$200.00	$7,410,000.00	$-	$7,410,000.00
8-Inch Ductile Iron Water Main	20,189	LF	190.00	3,840,000.00	-	3,840,000.00
Fire Hydrants (One Every 475 Feet According to WAC NR)	124	EA	5,400.00	670,000.00	-	670,000.00
100,000-Gallon Elevated Water Storage Tank	1	EA	950,000.00	950,000.00	25,000.00	1,322,000.00
Private-Side Services and Meter Set	329	EA	5,000.00	1,645,000.00	-	1,645,000.00
Abandonment of Contaminated Wells	329	EA	1,500.00	494,000.00	-	494,000.00
O&M Based on City of Peshtigo Transmission Costs and Alternative Design	57,228	LF	0.74	-	51,000.00	759,000.00
Land Acquisition (Elevated Water Tank)	0	EA	50,000.00	-		-
Subtotal				**$15,009,000.00**	**$76,000.00**	
Contingency and Professional Services				**$5,254,000.00**	**$16,000.00**	
Total				**$20,263,000.00**	**$92,000.00**	**$21,632,000.00**

	Phase 1A + Phase 1B
Alternative 1–20-Year Total with Distribution System	$43,359,000.00
Alternative 2–20-Year Total with Distribution System	$43,884,000.00
Alternative 3–20-Year Total with Distribution System	$30,915,000.00
Alternative 4–20-Year Total with Distribution System	$31,198,000.00

Table A-3 Opinion of Probable Cost for Phase 1A, 1B, and 2

Alternative 1–Groundwater Treatment Plant-Radium Only	Quantity	Units	Price Per	Capital Cost	Annual Cost	20-Year Total Present Cost
Well No. 1 Drilling For 16-Inch Finished Well	1	EA	$425,500.00	$426,000.00	$–	$426,000.00
Well No. 1 Radium Treatment Facility	1	EA	1,500,000.00	1,500,000.00	–	1,500,000.00
Well No. 1 12-Inch Ductile Iron Water Main Connection	14,800	LF	200.00	2,960,000.00	–	2,960,000.00
Well No. 1 Sanitary Connection	10,500	LF	175.00	1,840,000.00	–	1,840,000.00
Well No. 1 Chemicals	1	LS	2,000.00	–	2,000.00	30,000.00
Well No. 1 Electrical	1	LS	6,500.00	–	6,500.00	97,000.00
Well No. 1 Backwash Waste	1	LS	107,500.00	–	107,500.00	1,600,000.00
Land Acquisition	1	EA	50,000.00	50,000.00	–	50,000.00
Well No. 2 Drilling For 16-Inch Finished Well	1	EA	425,500.00	426,000.00	–	426,000.00
Well No. 2 Radium Treatment Facility	1	EA	1,500,000.00	1,500,000.00	–	1,500,000.00
Well No. 2 12-Inch Ductile Iron Water Main Connection	17,600	LF	200.00	3,520,000.00	–	3,520,000.00
Well No. 2 Sanitary Connection	13,200	LF	175.00	2,310,000.00	–	2,310,000.00
Well No. 2 Chemicals	1	LS	2,000.00	–	2,000.00	30,000.00
Well No. 2 Electrical	1	LS	6,500.00	–	6,500.00	97,000.00
Well No. 2 Backwash Waste	1	LS	107,500.00	–	107,500.00	1,600,000.00
Land Acquisition	1	EA	50,000.00	50,000.00	–	50,000.00
Subtotal				**$14,582,000.00**	**$232,000.00**	
Contingency and Professional Services				**$5,104,000.00**	**$47,000.00**	
Total				**$19,686,000.00**	**$279,000.00**	**$23,837,000.00**

Alternative 2–Surface Water Treatment	Quantity	Units	Price Per	Capital Cost	Annual Cost	20-Year Total Present Cost
Filtration Equipment–Two Trident® Treatment Units, Model TR-420A	1	LS	$765,000.00	$765,000.00	$–	$765,000.00
Intake Screen	1	EA	100,000.00	100,000.00	–	100,000.00
8-Inch Intake Pipe	2,000	EA	1,000.00	2,000,000.00	–	2,000,000.00
Sanitary Connection to City	36,000	LF	220.00	7,920,000.00	–	7,920,000.00
12-Inch Ductile Iron Water Main Connection	25100	LF	200.00	5,020,000.00	–	5,020,000.00
Water Treatment Facility	2,500	SQ FT	500.00	1,250,000.00	–	1,250,000.00
Process Pumps, Piping, and Fittings including Pumps for Raw Water, High Service, and Backwash	1	LS	100,000.00	100,000.00	–	100,000.00
Backwash Tank	1	EA	200,000.00	200,000.00	–	200,000.00
Clearwell (Concrete, Fitted for 25,000 Gallons)	1	EA	250,000.00	250,000.00	–	250,000.00
WTP Operation–Chemicals (Based on City of Marinette Chemical Treatment Costs and Town's Demand)	1	LS	11,000.00	–	14,000.00	209,000.00
WTP Operation–Electricity (Based on City of Marinette Power for Treatment Costs and Town's Demand)	1	LS	9,000.00	–	11,000.00	164,000.00
WTP Maintenance (Based On City of Marinette Maintenance Costs and Town's Demand)	1	LS	24,000.00	–	29,000.00	432,000.00
Land Acquisition	0	EA	50,000.00	–	–	–
Subtotal				**$17,605,000.00**	**$54,000.00**	
Contingency and Professional Services				**$6,162,000.00**	**$11,000.00**	
Total				**$23,767,000.00**	**$65,000.00**	**$24,735,000.00**

Alternative 3–City of Peshtigo Water System Extensions (Retail)	Quantity	Units	Price Per	Capital Cost	Annual Cost	20-Year Total Present Cost
12-Inch Ductile Iron Water Main Connection (City to Town)	24,336	LF	$200.00	$ 4,870,000.00	$–	$4,870,000.00
Fire Hydrants (One every 475 feet According to WAC NR)	51	EA	5,400.00	280,000.00	–	280,000.00
Booster Pumping Station Facility	1	EA	300,000.00	300,000.00	–	300,000.00
Booster Pumps, Motors, and VFD	1	EA	75,000.00	75,000.00	–	75,000.00
Water Retail Sales Based On City of Peshtigo Water Treatment Process Costs and Towns Demand	1	LS	171,000.00	–	206,000.00	3,065,000.00
O&M Based on City of Peshtigo Transmission Costs and Alternative Design	24,336	LF	0.74	–	22,000.00	328,000.00
Land Acquisition (Booster Station)	1	EA	50,000.00	50,000.00	–	50,000.00
Subtotal				**$5,575,000.00**	**$228,000.00**	
Contingency and Professional Services				**$1,952,000.00**	**$46,000.00**	
Total				**$7,527,000.00**	**$274,000.00**	**$11,604,000.00**

Alternative 4–City of Peshtigo Water System Wholesale	Quantity	Units	Price Per	Capital Cost	Annual Cost	20-Year Total Present Cost
12-Inch Ductile Iron Water Main Connection (City to Town)	24,336	LF	$200.00	$4,870,000.00	$–	$4,870,000.00
Fire Hydrants (One every 475 feet According to WAC NR)	51	EA	5,400.00	280,000.00	–	280,000.00
Booster Pumping Station Facility	1	EA	300,000.00	300,000.00	–	300,000.00
Booster Pumps, Motors, and VFD	1	EA	75,000.00	75,000.00	–	75,000.00
Quarterly Wholesale Volume From the City of Peshtigo	4	LS	51,000.00	–	245,000.00	3,645,000.00
O&M Based On City of Peshtigo Transmission Costs and Alternative Design	24,336	LF	0.74	–	22,000.00	328,000.00
Land Acquisition (Booster Station)	1	EA	50,000.00	50,000.00	–	50,000.00
Subtotal				**$3,335,000.00**	**$267,000.00**	
Contingency and Professional Services				**$1,168,000.00**	**$54,000.00**	
Total				**$4,503,000.00**	**$321,000.00**	**$12,303,000.00**

Distribution System Only–Phase 1A	Quantity	Units	Price Per	Capital Cost	Annual Cost	20-Year Total Present Cost
12-Inch Ductile Iron Water Main	18,892	LF	$200.00	$3,780,000.00	$–	$3,780,000.00
8-Inch Ductile Iron Water Main	12,673	LF	190.00	2,410,000.00	–	2,410,000.00
Fire Hydrants (One Every 475 Feet According to WAC NR)	70	EA	5,400.00	380,000.00	–	380,000.00
100,000-Gallon Elevated Water Storage Tank	1	EA	950,000.00	950,000.00	25,000.00	1,322,000.00
Private-Side Services and Meter Set	195	EA	5,000.00	975,000.00	–	975,000.00
Abandonment of Contaminated Wells	195	EA	1,500.00	293,000.00	–	293,000.00
O&M Based On City of Peshtigo Transmission Costs and Alternative Design	31,565	LF	0.74	–	28,000.00	417,000.00
Land Acquisition (Elevated Water Tank)	1	EA	50,000.00	50,000.00	–	50,000.00
Subtotal				**$8,838,000.00**	**$53,000.00**	
Contingency and Professional Services				**$3,094,000.00**	**$11,000.00**	
Total				**$11,932,000.00**	**$64,000.00**	**$12,885,000.00**

Distribution System Only–Phase 1B	Quantity	Units	Price Per	Capital Cost	Annual Cost	20-Year Total Present Cost
12-Inch Ductile Iron Water Main	18,147	LF	$200.00	$3,630,000.00	$–	$3,630,000.00
8-Inch Ductile Iron Water Main	7,516	LF	190.00	1,430,000.00	–	1,430,000.00
Fire Hydrants (One Every 475 Feet According to WAC NR)	54	EA	5,400.00	300,000.00	–	300,000.00
Private-Side Services and Meter Set	134	EA	5,000.00	670,000.00	–	670,000.00
Abandonment of Contaminated Wells	134	EA	1,500.00	201,000.00	–	201,000.00
O&M Based On City of Peshtigo Transmission Costs and Alternative Design	25,663	LF	0.74	–	23,000.00	343,000.00
Land Acquisition	0	EA	50,000.00	–	–	–
Subtotal				**$6,231,000.00**	**$23,000.00**	
Contingency and Professional Services				**$2,181,000.00**	**$5,000.00**	
Total				**$8,412,000.00**	**$28,000.00**	**$8,829,000.00**

Distribution System Only–Phase 2	Quantity	Units	Price Per	Capital Cost	Annual Cost	20-Year Total Present Cost
12-Inch Ductile Iron Water Main	81,669	LF	$200.00	$16,340,000.00	$–	$16,340,000.00
8-Inch Ductile Iron Water Main	30,812	LF	190.00	5,860,000.00	–	5,860,000.00
Fire Hydrants (One Every 475 Feet According to WAC NR)	237	EA	5,400.00	1,280,000.00	–	1,280,000.00
Upgrade to 200,000-Gallon tank	1	EA	400,000.00	400,000.00	25,000.00	772,000.00
Private-Side Services and Meter Set	560	EA	5,000.00	2,800,000.00	–	2,800,000.00
Abandonment of Contaminated Wells	560	EA	1,500.00	840,000.00	–	840,000.00
O&M Based on City of Peshtigo Transmission Costs and Alternative Design	112,481	LF	0.74	–	100,000.00	1,488,000.00
Land Acquisition	0	EA	50,000.00	–	–	–
Subtotal				**$27,520,000.00**	**$125,000.00**	
Contingency and Professional Services				**$9,632,000.00**	**$25,000.00**	
Total				**$37,152,000.00**	**$150,000.00**	**$39,384,000.00**

Distribution System Only–Phase 1A, 1B, & 2	Quantity	Units	Price Per	Capital Cost	Annual Cost	20-Year Total Present Cost
12-Inch Ductile Iron Water Main	118,708	LF	$200.00	$23,750,000.00	$–	$23,750,000.00
8-Inch Ductile Iron Ductile Iron Water Main	51,001	LF	190.00	9,700,000.00	–	9,700,000.00
Fire Hydrants (One Every 475 Feet According to WAC NR)	357	EA	5,400.00	1,930,000.00	–	1,930,000.00
200,000-Gallon Elevated Water Storage Tank	1	EA	1,350,000.00	1,350,000.00	25,000.00	1,722,000.00
Private-Side Services and Meter Set	889	EA	5,000.00	4,445,000.00	–	4,445,000.00
Abandonment of Contaminated Wells	889	EA	1,500.00	1,334,000.00	–	1,334,000.00
O&M Based On City of Peshtigo Transmission Costs and Alternative Design	169,709	LF	0.74	–	151,000.00	2,247,000.00
Land Acquisition	1	EA	50,000.00	50,000.00	–	50,000.00
Subtotal				**$42,559,000.00**	**$176,000.00**	
Contingency and Professional Services				**$14,896,000.00**	**$36,000.00**	
Total				**$57,455,000.00**	**212,000.00**	**$60,610,000.00**

						Phase 1A + Phase 1B + Phase 2
Alternative 1–20 Year Total With Distribution System						$84,447,000.00
Alternative 2–20 Year Total With Distribution System						$85,345,000.00
Alternative 3–20 Year Total With Distribution System						$72,214,000.00
Alternative 4–20 Year Total With Distribution System						$72,913,000.00

APPENDIX B
PROJECT SCHEDULE

Table B-1 shows the estimated project schedule for 2022.

Table B-1 Engineering Estimate Schedule–2022

Task Description	2022											
	February	March	April	May	June	July	August	September	October	November	December	
Agreement Execution												
Kickoff Meeting, Data Gathering and Site Visits												
Preliminary Engineering Report												
Permits / WDNR & PSC Submittals												
Engineering Design, Model												
Water Main Installation												
Tower Construction												
Booster Pump Station Construction												
Utility Staffing and Development												
System Startup												
Final Completion												

Table B-2 shows the estimated project schedule for 2023.

Table B-2 Engineering Estimate Schedule–2023

Task Description	2023											
	January	February	March	April	May	June	July	August	September	October	November	December
Agreement Execution												
Kickoff Meeting, Data Gathering and Site Visits												
Preliminary Engineering Report												
Permits / WDNR & PSC Submittals												
Engineering Design, Model												
Water Main Installation												
Tower Construction												
Booster Pump Station Construction												
Utility Staffing and Development												
System Startup												
Final Completion												

Table B-3 shows the estimated project schedule for 2024.

Table B-3 Engineering Estimate Schedule–2024

Task Description	2024											
	January	February	March	April	May	June	July	August	September	October	November	December
Agreement Execution												
Kickoff Meeting, Data Gathering and Site Visits												
Preliminary Engineering Report												
Permits / WDNR & PSC Submittals												
Engineering Design, Model												
Water Main Installation												
Tower Construction												
Booster Pump Station Construction												
Utility Staffing and Development												
System Startup												
Final Completion												

APPENDIX C
WDNR ENGINEERING REPORT REQUIREMENTS

Engineering Report Requirements

s. NR 811.09, Wis. Adm. Code

WISCONSIN DEPT. OF NATURAL RESOURCES

An engineering report shall be submitted with all reviewable projects with the exception of (distribution) water main extensions. The engineering report shall contain the controlling assumptions made and the factors used in determining the functional design of the proposed waterworks improvements as a whole and of each of the component parts or units. Where applicable, the report shall make reference to available regional, metropolitan, county or local water supply or water quality management plans and shall clearly indicate whether the proposed project is in conformance with the plans (s. NR 811.09(3), Wis. Adm. Code).

The engineering report shall, in all cases, indicate the basis of design and include the following specific data, if applicable (s. NR 811.09(4), Wis. Adm. Code):

(a) *Description.* A brief description of the project and the need for improvements;

(b) *Location.* A description of the geographic location of the project, including reference to maps or exhibits and the location of existing facilities;

(c) *Topography.* A brief description of the topography of the general area and its relation to the area involved in the project;

(d) *Population.* Past census data and estimated future projection to the design year for the area involved in the project;

(e) *Design period.* The design period being used for sizing major system components, based on the population projection;

(f) *Investigations.* The results of any investigations such as soil borings, test wells, pilot tests, water quality data, and fire flow tests;

(g) *Flooding.* Any areas of the project which are located within the floodway or floodplain;

(h) *Wetlands.* Any areas of the project which are to be located within a wetland, pass through a wetland or may impact a wetland shall be identified;

(i) *Recommendations.* After discussion of alternatives, the recommendations for improvements shall be listed and a statement of the reasons for selection of the recommended alternative shall be provided. A discussion of estimated capital costs and estimated annual operation and maintenance costs shall be included;

(j) *Specific information.* The report shall, in addition, include specific information relevant to the type of project. The specific information required for each type of project is as follows:

1. *Groundwater Sources* — Well site investigation report.
2. *Surface Water Sources* — Surface water investigation report.
3. *Water Treatment or Chemical Addition Process* — A summary establishing the adequacy of the proposed processes for the treatment of the specific water under consideration, including substantiation of the dosing and chemical blend proposed. Include any data from pilot or full-scale plant studies and describe the method of disposal of any wastes and any possible effects on the environment.
4. *Pumping Facilities* — A description of the area to be served and the basis for design, including maximum and minimum discharge heads and flows, pump operational controls, and provisions for emergency operation.
5. *Water Storage Facilities* — A description of the high to low static pressure range which the proposed facility will provide for existing and future service areas and the volume of domestic and fire storage required within the design period, and an explanation of how the proposed and existing facilities will meet these requirements. Provide a description of the relation and compatibility of the proposed facilities with existing facilities and any changes that will have to be made to the existing facilities.

APPENDIX D
TECHNICAL PROPOSAL FOR GROUNDWATER WELLS/WATER TREATMENT EQUIPMENT

Peshtigo WTP

Wisconsin

Engineer
Strand Associates

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Proposal Number: 2130483
Monday, November 22, 2021

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Technical Proposal

Item A – Two (2) Trident® Treatment Units, Model TR-420A

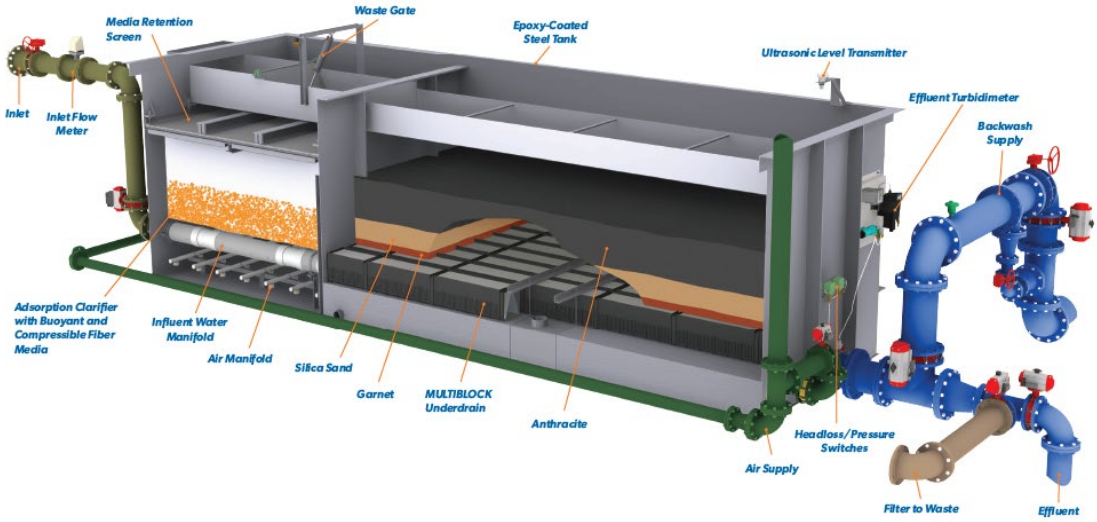
Design Criteria	
Application	Treatment for Drinking Water
Trident Design Flow	700 gpm per unit
Project Flow	500 gpm
Number of Units	2; (1 in service, 1 in standby; 100% Redundancy)
Adsorption Clarifier® Area	70 ft^2 per unit
Adsorption Clarifier Loading Rate	7.1 gpm/ft^2 (@ project flow)
Adsorption Clarifier Water Flush Rate	700 gpm (10 gpm/ft^2)
Adsorption Clarifier Air Flush Rate	700 scfm (10 $scfm/ft^2$)
Filter Area	140 ft^2 per unit
Filter Loading Rate	3.6 gpm/ft^2 (@ project flow)
Backwash Method	Air & Water
Low Rate Backwash Water Loading Rate	5 gpm/ft^2
Low Rate Backwash Water Flow Rate	700 gpm
High Rate Backwash Water Loading Rate*	15 gpm/ft^2*
High Rate Backwash Water Flow Rate*	2100 gpm
Airwash Loading Rate	5 $scfm/ft^2$
Airwash Flow Rate	700 scfm
Backwash Water Source	External backwash supply
Backwash Control	High and low using three valve loop configuration

* The design high rate backwash listed is based on a temperature of 25 °C. The actual backwash water rate must be adjusted 2% up or down for each degree Celsius difference above or below from design temperature; i.e., above 25 °C increase by 2%, below 25 °C decrease by 2%.

Features and Benefits

The Trident® system combines a variety of chemical treatment solutions. The patented MMAC Adsorption Clarifier® system and Mixed Media Filter deliver excellent predictable finished water quality. The system also includes the MULTIBLOCK® direct retention air/water backwash underdrain system. An optional scalloped underdrain allows for additional depth of filter or layer of activated carbon without an increase in tank height. Each system includes the Aquaritrol® PLC program for continuous effluent quality control.

- Treat water with up to 75 NTU or up to 35 color units.
- Treat water with combined total NTU and color of 75.
- Capable of 2 log removal of Crypto and Giardia size particles.
- Up to 3 log removal demonstrated by pilot studies.
- Proprietary design with over 700 installations.
- The clarifier reduces turbidity 75–95%, causing settling to be insignificant.
- The Trident system reduces coagulant usage 5–10% and filter aid usage as much as 60%.
- Installation costs are less than that of conventional systems.
- The footprint is up to 60% smaller than conventional plants.



Trident® system depicted. May not entirely reflect unit quoted.

Tankage Scope of Supply

Item	Size
Tank Material	Carbon Steel
Tank Dimensions	27 ft 10 in long x 8 ft 11 in wide x 8 ft 5 in high

Tank Connections

Item	Size
Influent	8 in
Filter Effluent/Backwash Supply	12 in
Waste/Overflow	16 in
Adsorption Clarifier Air	4 in
Filter Air	6 in

Tank Coatings

Item	Location
Tank Interior	Prepared per paint manufacturer recommendations, painted with one coat of Tnemec #N140-1255 Pota-Pox primer and one coat of Tnemec #N140-15BL Pota-Pox finish paint.
Tank Exterior	Prepared per paint manufacturer recommendations, painted with one coat of Tnemec #N140-1255 Pota-Pox. Field finish to be applied by others.
Tank Bottom	Tank is unpainted on bottom exterior surface and designed for installation on coal tar or asphaltic type base mastic compound applied to concrete base pad by others.

Adsorption Clarifier Scope of Supply

Feature	Quantity	Notes
Adsorption Clarifier Media	280 ft^3/unit	Media depth is 4 ft. Adsorption Clarifier media is 50% beads and 50% fiber balls. Beads are 50/50 R&S. All media is NSF Std. 61 approved.
Clarifier Media Retention	70 ft^2/unit	Stainless steel screen mesh under aluminum grating
Splash Guards	1 set/unit	For placement around the top tank perimeter of AC section on three sides; with support angles & attachment hardware
Collection Trough	1/unit	Rectangular trough with waste gate running length of AC section
Inlet Distribution	1 Lot/unit	PVC header-lateral pipe system with supports
Air Distribution	1 Lot/unit	PVC header-lateral pipe system with supports
Lower media support grating	70 ft^2/unit	Aluminum grating at the bottom of the AC section just above the header-lateral pipe distributions

Filter Scope of Supply

Feature	Quantity	Notes
MULTIBLOCK® Underdrain	140 ft^2/unit	Dual lateral blocks, 11” wide x 12” high x 36” long designed to interlock with each other to form the overall lateral length. The underdrain system shall include a factory installed media-retaining Laser Shield™ plate constructed of 304 stainless steel.
Washtrough	1/unit	Rectangular trough running length of filter section
Air/Water Distribution	1 Lot/unit	304 stainless steel plenum with air and water connections (factory installed)

Note

- Concrete fill of 5.9 yd^3/unit is required to be placed in the bottom of filter section for support of MULTIBLOCK laterals. Concrete fill and grout *not* by WesTech.
- All required hardware is supplied by WesTech for assembly of the tank internals at the jobsite by the contractor.

Media Scope of Supply

Type	Quantity	Layer Depth	Effective Size	Uniformity Coefficient	Packaging
Anthracite	213 ft^3/unit	18 in	1.0-1.1 mm	≤1.7	1-ft^3 bags on pallets
Silica Sand	111 ft^3/unit	9 in	0.35-0.45 mm	≤1.4	1-ft^3 bags on pallets
Garnet	37 ft^3/unit	3 in	0.2-0.32 mm	≤1.7	50# bags on pallets

Note

Media quantities include sufficient volume for skimming.

Air Scour Blower Scope of Supply

Quantity	Volume	Pressure	Type	Motor
2	350 scfm (each)	4.2 psig	Regenerative	15 hp, 230/460 V, 60 Hz, 3 ph, TEFC
Blower Accessories				
Air intake filter with dirty filter indicator				
Pressure safety relief valve				
Check valve				
Blower pressure indicator				

Note

Pressure gauge and switch to be placed in main air supply line.

Valves Scope of Supply

Item	Size	Quantity	Type	Operator Type
Influent	8 in	1/unit	Butterfly, Wafer	Electro-pneumatic, Modulating
Backwash Inlet	12 in	1/unit	Butterfly, Wafer	Pneumatic, Open/Close
Backwash High Rate	12 in	1/system	Butterfly, Wafer	Pneumatic, Open/Close
Effluent	8 in	1/unit	Butterfly, Wafer	Electro-pneumatic, Modulating
Filter to Waste	8 in	1/unit	Butterfly, Wafer	Electro-pneumatic, Modulating
AC Air Scour	4 in	1/unit	Butterfly, Wafer	Pneumatic, Open/Close
Filter Air Scour	6 in	1/unit	Butterfly, Wafer	Pneumatic, Open/Close
Waste Gate	N/A	1/unit	Linear Cylinder	Pneumatic, Open/Close
Backwash Low Rate Set	4 in	1/system	Butterfly, Wafer	Manual, Handwheel
Backwash High Rate Set	12 in	1/system	Butterfly, Wafer	Manual, Handwheel
Influent Isolation	8 in	1/unit	Butterfly, Wafer	Manual, Handwheel
AC Air Check	4 in	1/unit	Check	None
Filter Air Check	6 in	1/unit	Check	None

Note

All butterfly valves are **Bray** wafer style with cast iron body, nylon coated disc, EPDM seat and shaft seal. Automatic butterfly valves have double acting, weatherproof pneumatic cylinder actuators manufactured by **Bray**.

Trident Master Control Panel Scope of Supply

Feature	Description	Notes
Number of Panels	1	
Housing	NEMA 4/12	Wall mounted
PLC	Allen Bradley CompactLogix	Includes Aquaritrol program logic
OIT	Allen Bradley PanelView	10” color touchscreen interface
SCADA Interface		Communication protocol via Ethernet/IP

Instrumentation Scope of Supply

Description	Quantity	Type	Signal	Notes
Inlet Meter	1/unit	Magnetic Flow	4–20 mA	Endress+Hauser
Filter Liquid Level Transmitter	1/unit	Radar	4–20 mA	Endress+Hauser w/ mounting bracket
Backwash Control Level Switches	2/unit	Float	On/Off	One low & one high
Clarifier Pressure Transmitter	1/unit	Transmitter assembly with digital display	4-20 mA	Rosemount
Filter Pressure Transmitter	1/unit	Transmitter assembly with digital display	4-20 mA	Rosemount
Air Scour Blower Pressure Switch	1/system	2 ½ in, 0–5 psi	Discrete	Ashcroft
Effluent Turbidimeter	1/unit	TU5300 sc	To SC-200	HACH with calibration kit and power & communication cables
Turbidimeter Controller	1	SC-200	4-20 mA	HACH
Effluent Turbidity Sample Pump	1/unit	1/16 hp Centrifugal	N/A	115 V, 60 Hz, 1 ph

Coagulant Feed Scope of Supply

Feature	Quantity	Notes
Chemical Feed Pump	1	168 gpd positive displacement diaphragm type, electronic control by Aquaritrol® PLC program
Analog to Digital Converter	1	4–20 mA input, pulse output
Calibration Column	1	1000 mL with connection nipple
Corporation Stop and Nozzle	1	¾ in NPT-bronze with CPVC nozzle
Ball Valves	3	1/2 in NPT, PVC
Misc. Hardware	1 lot	

Note

Tank and mixer for liquid coagulant chemical feed system are to be provided by others.

Filter Aid Polymer Feed Scope of Supply

Feature	Quantity	Notes
Tank	1	360 gallon HDPE with cover
Chemical Feed Pump	1/unit	192 gpd positive displacement diaphragm type, electronic control by Aquaritrol® PLC program
Mixer	1	Tank mounted, gear drive 1/3 hp, 115/230 V, 60 Hz, single phase motor with stainless steel shaft and dual propellers. Support is included
Chemical Disperser	1	Funnel for mixing tank
Calibration Column	1	1000 mL with connection nipple
Corporation Stop and Nozzle	1	¾ in NPT-bronze with CPVC nozzle
Ball Valves	4	1/2 in NPT, PVC
Misc. Hardware	1 lot	

WesTech Trips to the Site

Total Trips	Total Days	Includes
5	16	Installation inspection of major Trident components, observation of filter media installation, startup, and instruction of plant personnel

Note: Any Item Not Listed Above to Be Furnished by Others.

Item B – Vertical Pressure Filter System, Model FPV21C

Design Criteria	
Application	Radium reduction via HMO
Design Flow	500 gpm
Number of Filters	Four (4)
Size of Each Filter	102 in diameter x 72 in side shell height
Filter Area	56.7 ft^2 per unit
Filter Loading Rate	2.94 gpm/ft^2 (with one unit offline)
Raw Water Iron Concentration	2.0 mg/L
Raw Water Manganese Concentration	0.97 mg/L
Filter Media Type	Dual Media
Filter Media Depth	30 in
Backwash Method	MULTIWASH
Backwash Rate (air/water)	5 gpm/ft^2* water and 3 $scfm/ft^2$ air
Backwash Rate (re-stratification)	15 gpm/ft^2* water only
Backwash Water Source	In-service filters
Backwash Control	Two Valve Loop (Modulating valve)

*The design backwash rate listed is based on a temperature of 25 °C. The actual backwash water rate must be adjusted 2% up or down for each degree Celsius difference above or below from design temperature; i.e., above 25 °C increase by 2%, below 25 °C decrease by 2%.

Features and Benefits

Vertical Pressure Filters are an effective, inexpensive, and low-maintenance method of reducing many raw water constituents including, but not limited to, iron, manganese, turbidity, color, arsenic (as co-precipitant). Water is introduced to the top side of the vessel where it passes through a bed of filter media to remove unwanted particulate. The water then passes an underdrain plate with distribution nozzles for effluent discharge. Once the media fouls to a predetermined set-point, a backwash cycle is required to dislodge residual particulate for waste discharge.

Vertical Pressure Filter systems with automatic valves and controls reduce operator attention. Backwashing from in-service filters reduces the scope of supply by eliminating the need for backwash supply pumps, tanks, and valves.

Vertical Pressure Filter System

Tankage Scope of Supply

Item	Details
Vessel quantity	Four (4)
Tank dimensions	102 in diameter x 72 in side shell height
Working pressure	100 psi
Test pressure	130 psi
Construction standard	ASME Code with stamp
Influent/Backwash waste connection	6 in flanged (side shell)
Effluent/Backwash supply connection	6 in flanged (center head)
Air scour connection	3 in flanged (side shell)
Air/Vacuum relief connection	2 in top head
Overdrain	MULTIWASH Process low-profile troughs with media retaining baffles and tube settlers
Air Scour	Sch. 80 PVC air wash grid with slotted laterals on 8 inch centers
Underdrain	Header and Lateral with gravel support nozzles (concrete fill by contractor)
Manways	(1) 18 in x 24 in elliptical
Tank Support	Structural steel legs

Fabrications Scope of Supply

Feature	Quantity	Notes
Filter Front Piping*	1 Lot	Sch. 40 Steel pipe, with ductile iron fittings. Pipe sections are flanged by plain end with one flange loose for field welding. Pipe sections shipped loose.
Overdrain*	4 Sets	MULTIWASH PRO® troughs – removable with media retaining baffles and tube settlers
Air Scour Grid*	4 Sets	Sch. 80 PVC header with slotted laterals.
Header Lateral Underdrain*	4 Sets	Sch 80 PVC header with NSF 61 listed ABS plastic gravel support nozzles. Grout fill is by others.

*Items are shipped loose for field installation into the filter tank by the installing contractor. PVC solvent and cement are not by WesTech. Air release piping past the valve by the installing contractor.

Media Scope of Supply

Type	Quantity	Depth	Effective Size	U. C.	Packaging
Anthracite*	240 ft^3	12 in	1.0-1.2 mm	$\leq$1.6	Bagged and palletized
Silica Sand*	356 ft^3	18 in	0.45-0.55 mm	$\leq$1.6	Bagged and palletized
Gravel	189 ft^3	10 in	3/16” x 3/32” (Next 3”) 1/2” x 3/16” (Next 3”) 3/4” x 1/2” (Bottom 4”)		Bagged and palletized

*Media quantities will include sufficient volume for skimming, typically 5% extra.

Valves Scope of Supply

Item	Quantity	Size	Type	Operator Type
Influent Valve	4	4 in	Open/Close	Electric
Backwash Waste	4	6 in	Open/Close	Electric
Backwash Low-Rate Set	1	3 in	Modulating	Electric
Backwash High-Rate Set	1	6 in	Modulating	Electric
Effluent	4	6 in	Open/Close	Electric
Air Scour	4	3 in	Open/Close	Electric
Filter to Waste/Backwash Supply	4	6 in	Open/Close	Electric
Common Effluent Isolation Valve	1	8 in	Open/Close	Electric
Common FTW/Backwash Supply Valve	1	6 in	Open/Close	Electric
Air/Vacuum Release	4	2 in	Automatic	Float actuated

All butterfly valves are Bray wafer style with cast iron body, nylon coated disc, EPDM seat and shaft seal. Manually controlled butterfly valves have lever or gear operated handwheel actuators. Automatic butterfly valves have double acting, weatherproof electric actuators manufactured by Bray.

Air/Vacuum relief assemblies for each tank consist of a Val-Matic, or equal, air/vacuum combination release valve and brass ball valves shipped in pieces for field assembly.

Backwash Control Panel Scope of Supply

Quantity	Number of Units Controlled	Operational Modes
1	Four	Manual, Semi-Automatic, Automatic
Feature	**Description**	**Notes**
Housing	NEMA 12; Steel	Wall Mounted
PLC	Allen Bradley CompactLogix	
OIT	Allen Bradley PanelView	Will graphically represent all buttons, lights, switches, etc.
UPS	15 minutes	
SCADA Interface	Ethernet	

Instrumentation Scope of Supply

Description	Quantity	Type	Output	Manufacturer
Loss of Head Gauge Assembly	1	General Filter #4879 with 4 ½ in gauges and differential pressure switch	Switch, 120 V	WesTech
Backwash Supply Flow	1	Magnetic Flow	4-20 mA	Rosemount

Airwash Blower Scope of Supply

Quantity	Volume	Pressure	Type	Motor
1	170 scfm	5 psi	Regenerative	15 hp, 230 V, 60 Hz, 3 ph, TEFC
Features		**Notes**		
Common Steel Base		Included		
Air Intake Filter		Dirty filter indicator included		
Pressure Relief Valve		Spring loaded		
Pressure Gauge		Included		
High Pressure Safety Valve		Included		

HMO System Scope of Supply

Feature	Quantity	Notes
Polyethylene tanks	3	Sizing TBD; $MnSO_4$ make-up tank; HMO blend tank, HMO Day Tank
Mixers	3	Chemical feed tank mixers
Pumps	3	Transfer pumps
Injection Quill	1	HMO injection Quill

Note: HMO systems also require a chlorination feed prior to HMO chemical addition to oxidize the iron.

Surface Preparation and Painting Scope of Supply

Location	Notes
Tank Interior	**Surface Preparation:** Sandblasted to SSPC-SP10/NACE 2 near white blast **Stripe coat:** One coat Tnemec Series N140-15BL (Tank White) Pota-Pox Plus primer applied with brush to all weld and hard to reach areas **Prime coat:** One shop coat of Tnemec Series N140-1255 (Beige) Pota-Pox Plus primer **Finish coat:** One coat of Tnemec N140-15BL (Tank White) Pota-Pox Plus finish
Tank Exterior	**Surface Preparation:** Sandblasted to SSPC-SP6/ NACE 3 commercial blast **Stripe coat:** one shop stripe coat of Tnemec Series N140-15BL (Tank White) Pota-Pox Plus primer applied with brush to all weld and hard to reach areas **Prime coat:** One shop coat of Tnemec Series N140-1255 (Beige) Pota-Pox Plus primer **Finish coat:** Applied by others.
Piping	Prepared per paint manufacturers recommendations **Prime coat:** One coat of Tnemec N140-1255 (Beige) Pota-Pox Plus on exterior only **Field finish**: Applied by others.
Leg Bottom	The legs shall be set in coal tar or asphaltic base mastic compound applied to concrete base pad by others.

Weights

Estimated Shipping Weight/Heaviest Piece	9,200 lbs
Estimated Operating Weight/Vessel	50,000 lbs

WesTech Trips to the Site

Total Trips	Total Days	Includes
3	8	Installation inspection, startup, instruction of plant personnel, and training

Note: Any item not listed above to be furnished by others.

Clarifications and Exceptions

General Clarifications

Terms & Conditions: This proposal, including all terms and conditions contained herein, shall become part of any resulting contract or purchase order. Changes to any terms and conditions, including but not limited to submittal and shipment days, payment terms, and escalation clause shall be negotiated at order placement, otherwise the proposal terms and conditions contained herein shall apply.

Paint: If your equipment has paint included in the price, please take note to the following. Primer paints are designed to provide only a minimal protection from the time of application (usually for a period not to exceed 30 days). Therefore, it is imperative that the finish coat be applied within 30 days of shipment on all shop primed surfaces. Without the protection of the final coatings, primer degradation may occur after this period, which in turn may require renewed surface preparation and coating. If it is impractical or impossible to coat primed surfaces within the suggested time frame, WesTech strongly recommends the supply of bare metal, with surface preparation and coating performed in the field. All field surface preparation, field paint, touch-up, and repair to shop painted surfaces are not by WesTech.

Escalation: If during the performance of the contract, the price of labor, material, freight, and other costs significantly increase, through no fault of WesTech, the price shall be equitably adjusted and subject to escalation. A significant price increase shall mean any price increase from proposal date to material procurement greater than 2.5% from stated prices. Delays and costs associated with a Force Majeure event shall also be equitably adjusted and subject to a change in price and/or schedule. Escalation to be based on cost increases, (without additional profit, overhead or margin) and shall include labor, material, freight, and other costs to WesTech that occur in the specified time period. Any revisions or changes requested by the customer will be priced on a case-by-case basis. Such price increases shall be documented through third party sources. Carbon material escalation will be based on the US Midwest Domestic Index, current flats and longs indexes, in effect at the time of bid. Stainless material escalation will be based the Argus Metals Stainless Steel ex works US base price plus surcharge for flat and bar (per design specified alloy), in effect at the time of bid.

USA Tariffs and Current Trade Laws: All prices are based on current USA and North America tariffs and trade laws/agreements at time of bid. Any changes in costs due to USA Tariffs and trade laws/ agreements will be passed through to the purchaser at cost.

Trident Clarifications

- Due to the current market volatility with material cost, the budget price should be updated routinely or when there are changes in the scope of supply. Note the budget price is only valid for 30 days from dated of budget proposal.
- Tank is designed for installation on coal tar or asphaltic type base mastic compound applied to concrete base pad by others.
- The filter is periodically backwashed (using treated water). The Adsorption Clarifier is normally washed (using influent water) one or more times between filter backwashes. The waste holding system should be sized to handle a total of two complete flush/wash volumes from each compartment.

- The influent pumping system should provide a range of 20–30 feet head at tank inlet connection. The high-rate water only backwash of the filter shall be 15–18 gpm/ft^2 with an available head of 13 feet at the tank connection.
- A 50 percent duty cycle is recommended for the compressed air system.
- Availability of equipment components specified may dictate substitutions of equal quality at the discretion of WesTech.
- All hardware is crated and shipped to the jobsite for assembly by the contractor.

Items Not Furnished by WesTech

- Unloading of equipment from delivering carrier, protected storage of equipment
- Installation of equipment, supervision of installation
- All underground and interconnecting piping, filter face piping and fittings, pipe supports, wall inserts or sleeves, Dresser or flexible couplings, hangers, valves (not specifically listed), pneumatic tubing from air compressor to filter batteries, air release piping and valves, sampling lines and sinks, small pressure water supply piping, field work of piping (i.e., drilling and tapping for instrumentation) and flow meters (not specifically listed)
- Interconnection wiring and conduit
- Walkways, handrails, stairways and ladders
- Finish paint and intermediate field coats, cathodic protection systems
- All chemical feeders (not specifically listed), feed lines, chemicals, tanks (not specifically listed), labor and procedures for the disinfection of equipment, laboratory test equipment
- Structural design, supply and installation of concrete pads, foundations, rebar, anchors, concrete, grout, sealant, sumps and concrete fill for filter underdrains
- Motor control center, motor starters, disconnects, electrical wiring and conduit, connection of electrical wiring to terminals within WesTech's control panels, telemetering equipment, turbidity monitoring equipment (not specifically listed), supports for controls
- SCADA System
- All pumps (not specifically listed), air compressors, dryers, operating and start-up lubricants
- Any equipment or service not listed in this proposal

Vertical Pressure Filter Clarifications

- Availability of equipment components specified may dictate substitutions of equal quality at the discretion of WesTech.
- All hardware is crated and shipped to the jobsite for assembly by the contractor.
- The effluent of all pressure vessels should never be allowed to drop below 10 feet H2O pressure during operation of vessel. Failure to maintain the effluent pressure could result in de-watering the media inside the vessel.
- MULTIWASH™ units need to discharge to atmosphere due to the combined air and water step.

Items not furnished by WesTech

- Unloading of equipment from delivering carrier, protected storage of equipment, installation, supervision of installation
- All underground and interconnecting piping, piping and fittings (not specifically listed), pipe supports, wall inserts or sleeves, Dresser or flexible couplings, hangers, valves (not specifically listed), pneumatic tubing from air compressor to filter batteries, air release piping and valves, sampling lines and sinks, small pressure water supply piping, field work of piping (i.e., drilling and tapping for instrumentation) and flow meters
- Walkways, handrails, stairways and ladders
- Finish paint and intermediate field coats, cathodic protection systems
- All chemical feeders, feed lines, chemicals, labor and procedures for the disinfection of equipment, laboratory test equipment unless specifically noted
- Structural design, supply and installation of concrete pads, foundations, rebar, anchors, concrete, grout, sealant and sumps
- Motor control center, motor starters, disconnects, electrical wiring and conduit, connection of electrical wiring to terminals within WesTech's control panels, telemetering equipment, level controls, supports for controls
- All pumps, operating and start-up lubricants
- Any equipment and service not listed in this proposal
- Air release piping past the valves.

Exceptions

Not applicable

Commercial Proposal

Proposal Name: Peshtigo WTP
Proposal Number: 2130483
Monday, November 22, 2021

1. Bidder's Contact Information

Company Name	WesTech Engineering, LLC
Primary Contact Name	Tom Dumbaugh
Phone	801.265.1000
Email	tdumbaugh@westech-inc.com
Address: Number/Street	3665 S West Temple
Address: City, State, Zip	Salt Lake City, UT 84115

2. Budget Pricing

Currency: US Dollars

	Scope of Supply	
A	(2) Trident® TR-420A Units, Model TR-420A	$765,000
B	Vertical Pressure Filter System, Model FPV21C	$875,000
	Taxes (sales, use, VAT, IVA, IGV, duties, import fees, etc.)	Not Included

Prices are valid for a period not to exceed 30 days from date of proposal.

Additional Field Service	
Daily Rate (Applicable Only to Field Service Not Included in Scope)	$1,200

Pricing does not include field service unless noted in scope of supply, but is available at the daily rate plus expenses. The greater of a two week notice or visa procurement time is required prior to departure date. Our field service policy can be provided upon request for more details.

3. Payment Terms

Purchase Order Acceptance and Contract Execution	10%
Submittals Provided by WesTech	15%
Release for Fabrication	35%
Notification of Ready to Ship	40%

All payments are net 30 days. Partial shipments are allowed. An approved Letter of Credit is required if Incoterms CIF, CFR, DAP, CIP, or CPT are applicable. Payment is required in full for all other Incoterms prior to international shipment. Other terms per WesTech proforma invoice. Please note that the advising bank must be named as: Wells Fargo Bank, International Department, 9000 Flair Drive, 3rd Floor, El Monte, California 91731, USA.

4. Schedule - Trident

Submittals, after Purchase Order Acceptance and Contract Execution	10 to 12 weeks
Ready to Ship, after Receipt of Final Submittal Approval	22 to 24 weeks
Estimated Weeks to Ready to Ship	**32 to 36 weeks***

*Customer submittal approval is typically required to proceed with equipment fabrication and is not accounted for in the schedule above. Project schedule will be extended to account for time associated with receipt of customer submittal approval.

Schedule – Pressure Filter

Submittals, after Purchase Order Acceptance and Contract Execution	6 to 8 weeks
Ready to Ship, after Receipt of Final Submittal Approval	32 to 36 weeks
Estimated Weeks to Ready to Ship	**38 to 44 weeks***

*Customer submittal approval is typically required to proceed with equipment fabrication and is not accounted for in the schedule above. Project schedule will be extended to account for time associated with receipt of customer submittal approval.

5. Freight

Domestic	FOB Shipping Point - Full Freight Allowed to Jobsite (FSP-FFA)	
From	**Final Destination**	**Number of Trucks or Containers**
WesTech Shops	Peshtigo, WI	TBD

One-Year Warranty

WesTech equipment is backed by WesTech's reputation as a quality manufacturer, and by many years of experience in the design of reliable equipment.

Equipment manufactured or sold by WesTech Engineering, LLC, once paid for in full, is backed by the following warranty:

For the benefit of the original user, WesTech warrants all new equipment manufactured by WesTech Engineering, LLC. to be free from defects in material and workmanship, and will replace or repair, F.O.B. its factories or other location designated by it, any part or parts returned to it which WesTech's examination shall show to have failed under normal use and service by the original user within one (1) year following initial start-up, or eighteen (18) months from shipment to the purchaser, whichever occurs first.

Such repair or replacement shall be free of charge for all items except for those items such as resin, filter media and the like that are consumable and normally replaced during maintenance, with respect to which, repair or replacement shall be subject to a pro-rata charge based upon WesTech's estimate of the percentage of normal service life realized from the part. WesTech's obligation under this warranty is conditioned upon its receiving prompt notice of claimed defects, which shall in no event be later than thirty (30) days following expiration of the warranty period, and is limited to repair or replacement as aforesaid.

This warranty is expressly made by WesTech and accepted by purchaser in lieu of all other warranties, including warranties of merchantability and fitness for particular purpose, whether written, oral, express, implied, or statutory. WesTech neither assumes nor authorizes any other person to assume for it any other liability with respect to its equipment. WesTech shall not be liable for normal wear and tear, corrosion, or any contingent, incidental, or consequential damage or expense due to partial or complete inoperability of its equipment for any reason whatsoever.

This warranty shall not apply to equipment or parts thereof which have been altered or repaired outside of a WesTech factory, or damaged by improper installation, application, or maintenance, or subjected to misuse, abuse, neglect, accident, or incomplete adherence to all manufacturer’s requirements, including, but not limited to, Operations & Maintenance Manual guidelines & procedures.

This warranty applies only to equipment made or sold by WesTech Engineering, LLC.

WesTech Engineering, LLC. makes no warranty with respect to parts, accessories, or components purchased by the customer from others. The warranties which apply to such items are those offered by their respective manufacturers.

Terms & Conditions

Terms and Conditions appearing in any order based on this proposal which are inconsistent herewith shall not be binding on WesTech Engineering, LLC The sale and purchase of equipment described herein shall be governed exclusively by the foregoing proposal and the following provisions:

1. SPECIFICATIONS: WesTech Engineering, LLC is furnishing its standard equipment as outlined in the proposal and as will be covered by final approved drawings. The equipment may not be in strict compliance with the Engineer's/Owner's plans, specifications, or addenda as there may be deviations. The equipment will, however, meet the general intention of the mechanical specifications of these documents.

2. ITEMS INCLUDED: This proposal includes only the equipment specified herein and does not include erection, installation, accessories, nor associated materials such as controls, piping, etc., unless specifically listed.

3. PARTIES TO CONTRACT: WesTech Engineering, LLC is not a party to or bound by the terms of any contract between WesTech Engineering, LLC's customer and any other party. WesTech Engineering, LLC's undertakings are limited to those defined in the contract between WesTech Engineering, LLC and its direct customers.

4. PRICE AND DELIVERY: All selling prices quoted are subject to change without notice after 30 days from the date of this proposal unless specified otherwise. Unless otherwise stated, all prices are F.O.B. WesTech Engineering, LLC or its supplier's shipping points. All claims for damage, delay or shortage arising from such equipment shall be made by Purchaser directly against the carrier. When shipments are quoted F.O.B. job site or other designation, Purchaser shall inspect the equipment shipped, notifying WesTech Engineering, LLC of any damage or shortage within forty-eight hours of receipt, and failure to so notify WesTech Engineering, LLC shall constitute acceptance by Purchaser, relieving WesTech Engineering, LLC of any liability for shipping damages or shortages.

5. PAYMENTS: All invoices are net 30 days. Delinquencies are subject to a 1.5 percent service charge per month or the maximum permitted by law, whichever is less on all past due accounts. Pro rata payments are due as shipments are made. If shipments are delayed by the Purchaser, invoices shall be sent on the date when WesTech Engineering, LLC is prepared to make shipment and payment shall become due under standard invoicing terms. If the work to be performed hereunder is delayed by the Purchaser, payments shall be based on the purchase price and percentage of completion. Products held for the Purchaser shall be at the risk and expense of the Purchaser. Unless specifically stated otherwise, prices quoted are for equipment only. These terms are independent of and not contingent upon the time and manner in which the Purchaser receives payment from the owner.

6. PAYMENT TERMS: Credit is subject to acceptance by WesTech Engineering, LLC's Credit Department. If the financial condition of the Purchaser at any time is such as to give WesTech Engineering, LLC, in its judgment, doubt concerning the Purchaser's ability to pay, WesTech Engineering, LLC may require full or partial payment in advance or may suspend any further deliveries or continuance of the work to be performed by the WesTech Engineering, LLC until such payment has been received.

7. ESCALATION: If during the performance of the contract, the price of labor, material, freight, and other costs significantly increase, through no fault of WesTech, the price shall be equitably adjusted and subject to escalation. A significant price increase shall mean any price increase from proposal date to material procurement greater than 2.5% from stated prices. Delays and costs associated with a Force Majeure event shall also be equitably adjusted and subject to a change in price and/or schedule. Escalation to be based on cost increases, (without additional profit, overhead or margin) and shall include labor, material, freight, and other costs to WesTech that occur in the specified time period. Any revisions or changes requested by the customer will be priced on a case-by-case basis. Such price increases shall be documented through third party sources. Carbon material escalation will be based on the US Midwest Domestic Index, current flats and longs indexes, in effect at the time of bid. Stainless material escalation will be based the Argus Metals Stainless Steel ex works US base price plus surcharge for flat and bar (per design specified alloy), in effect at the time of bid.

8. APPROVAL: If approval of equipment submittals by Purchaser or others is required, a condition precedent to WesTech Engineering, LLC supplying any equipment shall be such complete approval.

9. INSTALLATION SUPERVISION: Prices quoted for equipment do not include installation supervision. WesTech Engineering, LLC recommends and will, upon request, make available, at WesTech Engineering, LLC's then current rate, an experienced installation supervisor to act as the Purchaser's employee and agent to supervise installation of the equipment. Purchaser shall at its sole expense furnish all necessary labor equipment, and materials needed for installation.

Responsibility for proper operation of equipment, if not installed by WesTech Engineering, LLC or installed in accordance with WesTech Engineering, LLC's instructions, and inspected and accepted in writing by WesTech Engineering, LLC, rests entirely with Purchaser; and any work performed by WesTech Engineering, LLC personnel in making adjustment or changes must be paid for at WesTech Engineering, LLC's then current per diem rates plus living and traveling expenses.

WesTech Engineering, LLC will supply the safety devices described in this proposal or shown in WesTech Engineering, LLC's drawings furnished as part of this order but excepting these, WesTech Engineering, LLC shall not be required to supply or install any safety devices whether required by law or otherwise. The Purchaser hereby agrees to indemnify and hold harmless WesTech Engineering, LLC from any claims or losses arising due to alleged or actual insufficiency or inadequacy of the safety devices offered or supplied hereunder, whether specified by WesTech Engineering, LLC or Purchaser, and from any damage resulting from the use of the equipment supplied hereunder.

10. ACCEPTANCE OF PRODUCTS: Products will be deemed accepted without any claim by Purchaser unless written notice of non-acceptance is received by WesTech Engineering, LLC within 30 days of delivery if shipped F.O.B. point of shipment, or 48 hours of delivery if shipped F.O.B. point of destination. Such written notice shall not be considered received by WesTech Engineering, LLC unless it is accompanied by all freight bills for said shipment, with Purchaser's notations as to damages, shortages and conditions of equipment, containers, and seals. Non-accepted products are subject to the return policy stated below.

11. TAXES: Any federal, state, or local sales, use or other taxes applicable to this transaction, unless specifically included in the price, shall be for Purchaser's account.

12. TITLE: The equipment specified herein, and any replacements or substitutes therefore shall, regardless of the manner in which affixed to or used in connection with realty, remain the sole and personal property of WesTech Engineering, LLC until the full purchase price has been paid. Purchaser agrees to do all things necessary to protect and maintain WesTech Engineering, LLC's title and interest in and to such equipment; and upon Purchaser's default, WesTech Engineering, LLC may retain as liquidated damages any and all partial payments made and shall be free to enter the premises where such equipment is located and remove the same

as its property without prejudice to any further claims on account of damages or loss which WesTech Engineering, LLC may suffer from any cause.

13. INSURANCE: From date of shipment until the invoice is paid in full, Purchaser agrees to provide and maintain at its expense, but for WesTech Engineering, LLC's benefit, adequate insurance including, but not limited to, builders risk insurance on the equipment against any loss of any nature whatsoever.

14. SHIPMENTS: Any shipment of delivery dates recited represent WesTech Engineering, LLC's best estimate but no liability, direct or indirect, is assumed by WesTech Engineering, LLC for failure to ship or deliver on such dates.

WesTech Engineering, LLC shall have the right to make partial shipments; and invoices covering the same shall be due and payable by Purchaser in accordance with the payment terms thereof. If Purchaser defaults in any payment when due hereunder, WesTech Engineering, LLC may, without incurring any liability therefore to Purchaser or Purchaser's customers, declare all payments immediately due and payable with maximum legal interest thereon from due date of said payment, and at its option, stop all further work and shipments until all past due payments have been made, and/or require that any further deliveries be paid for prior to shipment.

If Purchaser requests postponements of shipments, the purchase price shall be due and payable upon notice from WesTech Engineering, LLC that the equipment is ready for shipment; and thereafter any storage or other charge WesTech Engineering, LLC incurs on account of the equipment shall be for the Purchaser's account.

If delivery is specified at a point other than WesTech Engineering, LLC or its supplier's shipping points, and delivery is postponed or prevented by strike, accident, embargo, or other cause beyond WesTech Engineering, LLC's reasonable control and occurring at a location other than WesTech Engineering, LLC or its supplier's shipping points, WesTech Engineering, LLC assumes no liability in delivery delay. If Purchaser refuses such delivery, WesTech Engineering, LLC may store the equipment at Purchaser's expense. For all purposes of this agreement such tender of delivery or storage shall constitute delivery.

15. WARRANTY: WESTECH ENGINEERING, LLC WARRANTS EQUIPMENT IT SUPPLIES ONLY IN ACCORDANCE WITH THE WARRANTY EXPRESSED IN THE ATTACHED COPY OF "WESTECH WARRANTY" AGAINST DEFECTS IN WORKMANSHIP AND MATERIALS WHICH IS MADE A PART HEREOF. SUCH WARRANTY IN LIEU OF ALL OTHER WARRANTIES, INCLUDING WARRANTIES OF MERCHANTABILITY AND FITNESS FOR PARTICULAR PURPOSE, WHETHER WRITTEN, ORAL, EXPRESSED, IMPLIED OR STATUTORY, WESTECH ENGINEERING, LLC SHALL NOT BE LIABLE ANY CONTINGENT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES FOR ANY REASON WHATSOEVER.

16. PATENTS: WesTech Engineering, LLC agrees that it will, at its own expense, defend all suits or proceedings instituted against Purchaser and pay any award of damages assessed against it in such suits or proceedings, so far as the same are based on any claim that the said equipment or any part thereof constitutes an infringement of any apparatus patent of the United States issued at the date of this Agreement, provided WesTech Engineering, LLC is given prompt notice in writing of the institution or threatened institution of any suit or proceeding and is given full control of the defense, settlement, or compromise of any such action; and Purchaser agrees to give WesTech Engineering, LLC needed information, assistance, and authority to enable WesTech Engineering, LLC so to do. In the event said equipment is held or conceded to infringe such a patent, WesTech Engineering, LLC shall have the right at its sole option and expense to a) modify the equipment to be non-infringing, b) obtain for Purchaser the license to continue using said equipment, or c) accept return of the equipment and refund to the Purchaser the purchase price thereof less a reasonable charge for the use thereof. WesTech Engineering, LLC will reimburse Purchaser for actual out-of-pocket expenses, exclusive of legal fees, incurred in preparing such information and rendering such assistance at WesTech Engineering, LLC's request. The foregoing states the entire liability of WesTech Engineering, LLC, with respect to patent infringement; and except as otherwise agreed to in writing, WesTech Engineering, LLC assumes no responsibility for process patent infringement.

17. SURFACE PREPARATION AND PAINTING: If furnished, shop primer paint is intended to serve only as minimal protective finish. WesTech Engineering, LLC will not be responsible for the condition of primed or finish painted surfaces after equipment leaves its shops. Purchasers are invited to inspect paint in shops for proper preparation and application prior to shipment. WesTech Engineering, LLC assumes no responsibility for field surface preparation or touch-up of shipping damage to paint. Painting of fasteners and other touch-up to painted surfaces will be by Purchaser's painting contractor after mechanism installation.

Motors, gear motors, and other components not manufactured by WesTech Engineering, LLC will be painted with that manufacturer's standard paint system. It is WesTech Engineering, LLC's intention to ship major steel components as soon as fabricated, often before drive, motors, and other manufactured components. Unless Purchaser can ensure that shop primed steel shall be field painted within thirty (30) days after arrival at the job site, WesTech Engineering, LLC encourages the Purchaser to order these components without primer.

WesTech Engineering, LLC's prices are based on paints and surface preparations as outlined in the main body of this proposal. In the event that an alternate paint system is selected, WesTech Engineering, LLC requests that Purchaser's order advise of the paint selection. WesTech Engineering, LLC will then either adjust the price as may be necessary to comply or ship the material unpainted if compliance is not possible due to application problems or environmental controls.

18. CANCELLATION, SUSPENSION, OR DELAY: After acceptance by WesTech Engineering, LLC, this proposal, or Purchaser's order based on this proposal, shall be a firm agreement and is not subject to cancellation, suspension, or delay except upon payment by Purchaser of appropriate charges which shall include all costs incurred by WesTech Engineering, LLC to date of cancellation, suspension, or delay plus a reasonable profit. Additionally, all charges related to storage and/or resumption of work, at WesTech Engineering, LLC's plant or elsewhere, shall be for Purchaser's sole account; and all risks incidental to storage shall be assumed by Purchaser.

19. FORCE MAJEURE: Neither party hereto shall be liable to the other for default or delay in delivery caused by extreme weather or other act of God, strike or other labor shortage or disturbance, fire, accident, war or civil disturbance, act of government, pandemic, delay of carriers, failure of normal sources of supply, complete or partial shutdown of plant by reason of inability to attain sufficient raw materials or power, and/or other similar contingency beyond the reasonable control of the respective parties. The time for delivery specified herein shall be extended during the continuance of such conditions, or any other cause beyond such party's reasonable control.

20. RETURN OF PRODUCTS: No products may be returned to WesTech Engineering, LLC without WesTech Engineering, LLC's prior written permission. Said permission may be withheld by WesTech Engineering, LLC at its sole discretion.

21. BACKCHARGES: WesTech Engineering, LLC will not approve or accept backcharges for labor, materials, or other costs incurred by Purchaser or others in modification, adjustment, service, or repair of WesTech Engineering, LLC-furnished materials unless such back charge has been authorized in advance in writing by a WesTech Engineering, LLC employee, by a WesTech Engineering, LLC purchase order, or work requisition signed by WesTech Engineering, LLC

22. INDEMNIFICATION: Purchaser agrees to indemnify WesTech Engineering, LLC from all costs incurred, including but not limited to court costs and reasonable attorney fees, from enforcing any provisions of this contract, including but not limited to breach of contract or costs incurred in collecting monies owed on this contract.

23. ENTIRE AGREEMENT: This proposal expresses the entire agreement between the parties hereto superseding any prior understandings, and is not subject to modification except by a writing signed by an authorized officer of each party.

24. MOTORS AND MOTOR DRIVES: In order to avoid shipment delays of WesTech Engineering, LLC equipment, the motor drives may be sent directly to the job site for installation by the equipment installer. Minor fit-up may be required.

25. EXTENDED STORAGE: Extended storage instructions will be part of information provided to shipment. If equipment installation and start-up is delayed more than 30 days, the provisions of the storage instructions must be followed to keep WARRANTY in force.

26. LIABILITY: Professional liability insurance, including but not limited to, errors and omissions insurance, is included. In any event, liability for errors and omissions shall be limited to the lesser of $100,000USD or the value of the particular piece of equipment (not the value of the entire order) supplied by WesTech Engineering, LLC against which a claim is sought.

27. ARBITRATION NEGOTIATION: Any controversy or claim arising out of or relating to the performance of any contract resulting from this proposal or contract issued, or the breach thereof, shall be settled by arbitration in accordance with the Construction Industry Arbitration Rules of the American Arbitration Association, and judgment upon the award rendered by the arbitrator(s) may be entered to any court having jurisdiction.

ACCEPTED BY PURCHASER

Customer Name: _____

Customer Address: _____

_____

_____

Contact Name: _____

Contact Phone: _____

Contact Email: _____

Signature: _____

Printed Name: _____

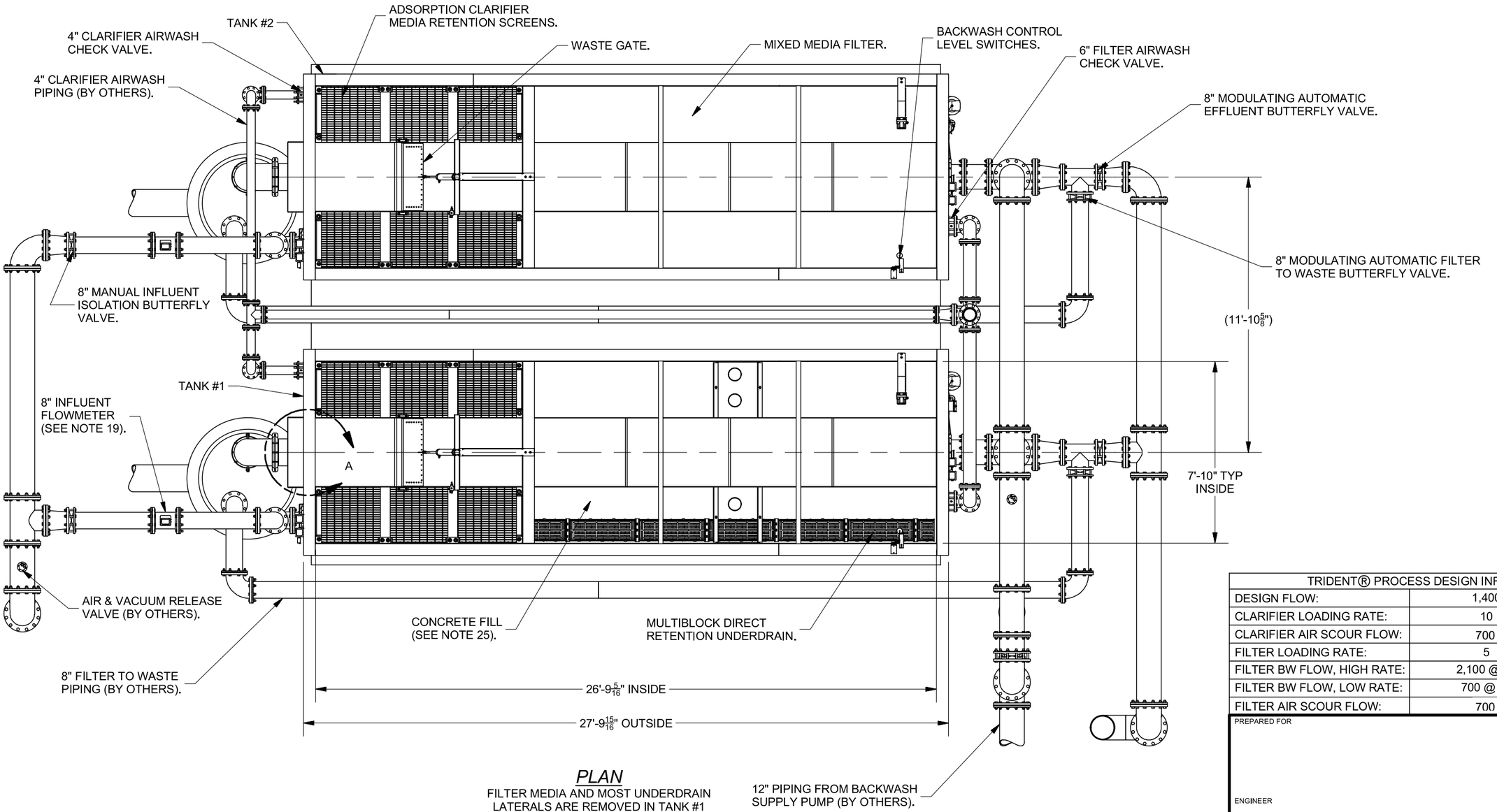
Title: _____

Date: _____

Supplemental Information

General Arrangement Drawings
Brochure

DRAFT-OWNER REVIEW



PLAN

FILTER MEDIA AND MOST UNDERDRAIN LATERALS ARE REMOVED IN TANK #1

TRIDENT® PROCESS DESIGN INFORMATION		
DESIGN FLOW:	1,400	GPM
CLARIFIER LOADING RATE:	10	GPM/SQ FT
CLARIFIER AIR SCOUR FLOW:	700	SCFM
FILTER LOADING RATE:	5	GPM/SQ FT
FILTER BW FLOW, HIGH RATE:	2,100 @ 60	GPM @ °F
FILTER BW FLOW, LOW RATE:	700 @ 60	GPM @ °F
FILTER AIR SCOUR FLOW:	700	SCFM

PREPARED FOR

ENGINEER

CONTRACTOR

PO/CONTRACT NUMBER

REV	REVISION DESCRIPTION	ECN	DESIGNER	APPROVER	DATE

REFERENCE DOCUMENTS

WESTECH

TITLE **GENERAL ARRANGEMENT, TR-420A, AA**

TRIDENT® TR-420A WATER TREATMENT SYSTEM

DESIGNER	CHECKER	APPROVER	DATE
BA91	SH40	JA20	2012-06-04

DOCUMENT NUMBER	SHEET	REV
9001084000	1 OF 4	-

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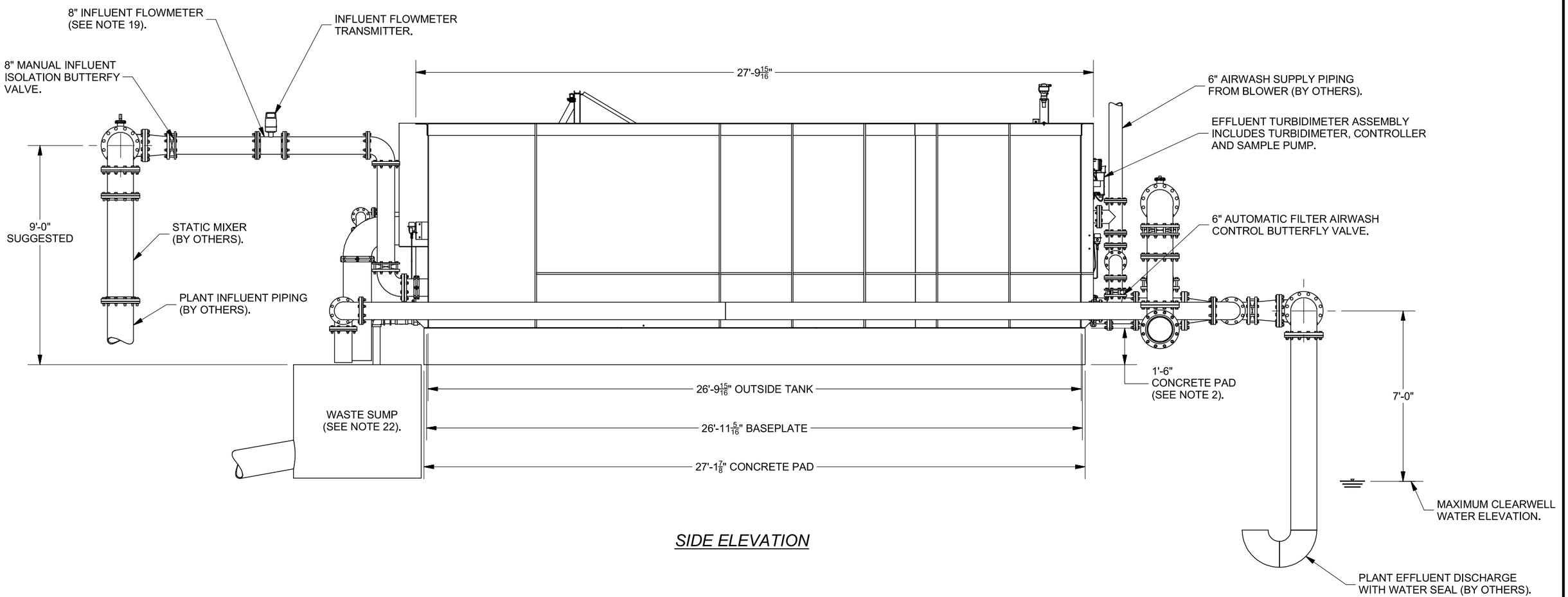
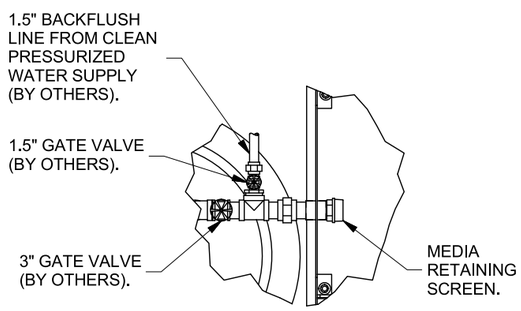


SIDE ELEVATION



DETAIL A
AT CLARIFIER DRAIN LEVEL

WESTECH

TITLE **GENERAL ARRANGEMENT, TR-420A, AA**
TRIDENT® TR-420A WATER TREATMENT SYSTEM

DESIGNER	CHECKER	APPROVER	DATE
BA91	SH40	JA20	2012-06-04

DOCUMENT NUMBER	SHEET	REV
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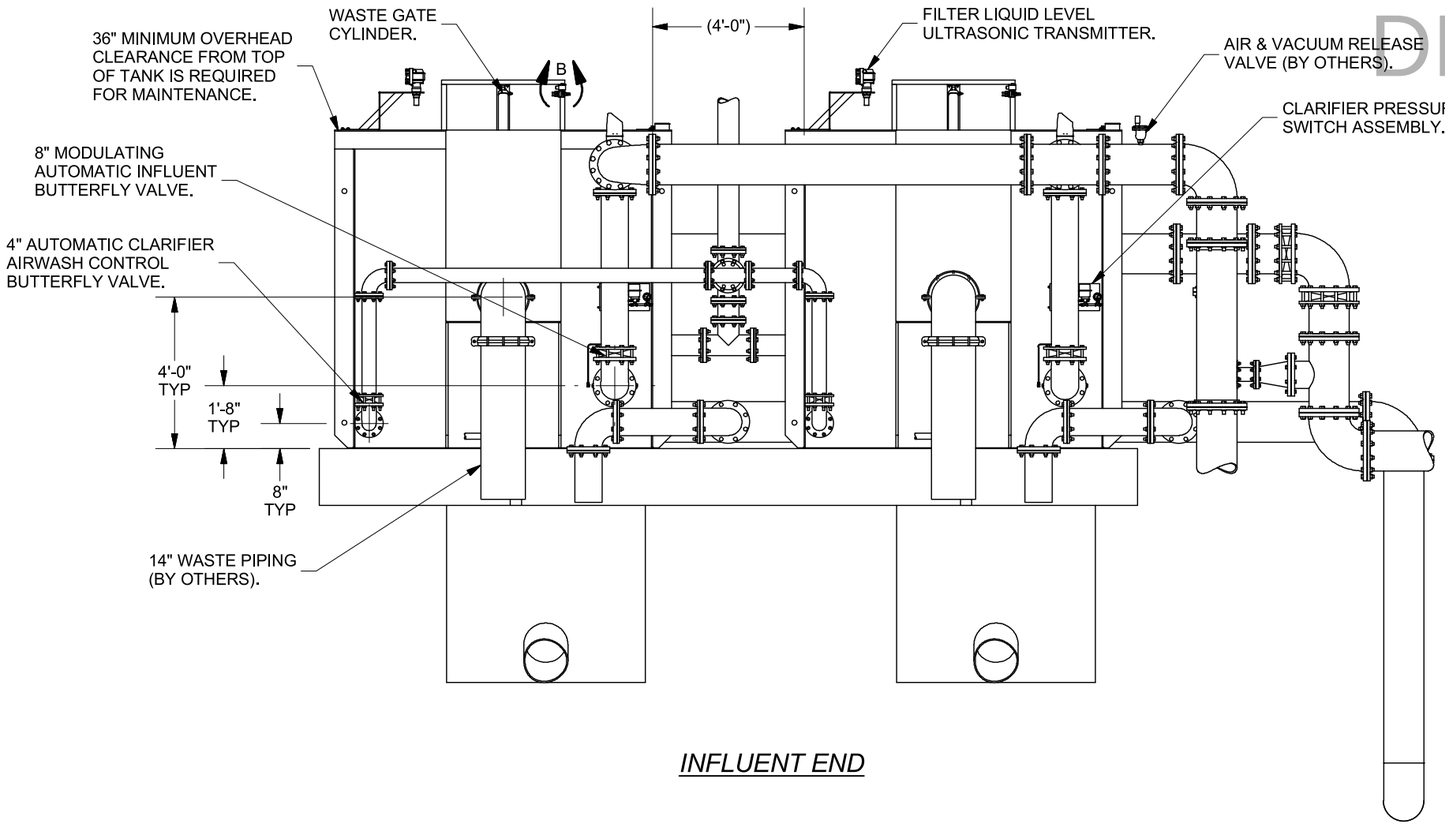
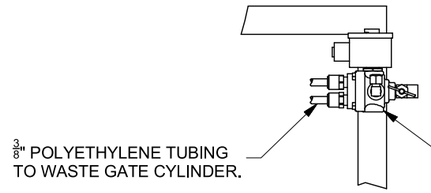
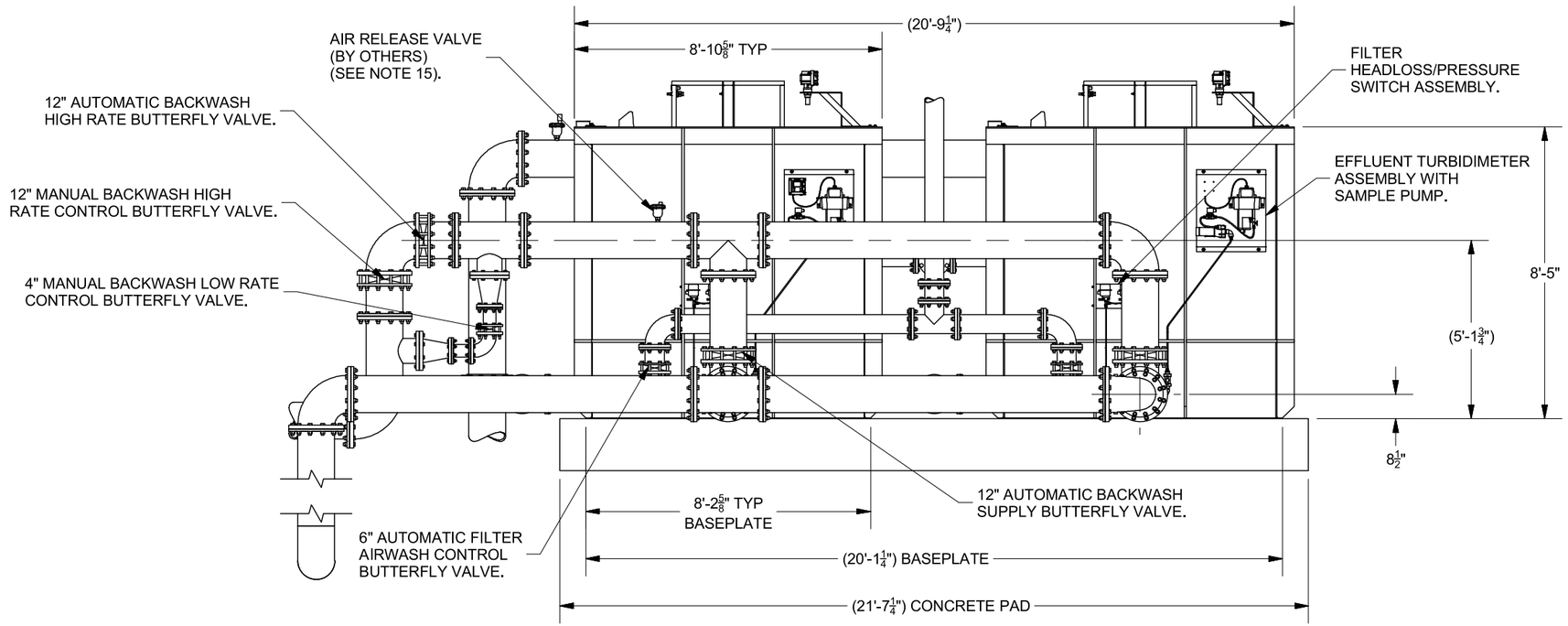


INFLUENT END



DETAIL B



EFFLUENT END

WESTECH

TITLE **GENERAL ARRANGEMENT, TR-420A, AA**

TRIDENT® TR-420A WATER TREATMENT SYSTEM

DESIGNER	CHECKER	APPROVER	DATE	
BA91	SH40	JA20	2012-06-04	
DOCUMENT NUMBER			SHEET	REV
9001084000			3 OF 4	-

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NOTES:

1.) EQUIPMENT FURNISHED BY WESTECH ENGINEERING IS DESCRIBED IN A SEPARATE EQUIPMENT LIST. ADDITIONAL PIPING, PIPE SUPPORTS, AND CONNECTION FITTINGS ARE NOT INCLUDED WITH STANDARD UNIT. MAJOR EQUIPMENT AND COMPONENTS TO BE INSTALLED AT JOBSITE, BY INSTALLING CONTRACTOR.

2.) EQUIPMENT CONCRETE PAD DESIGN IS THE RESPONSIBILITY OF THE CONSULTING ENGINEER.

3.) PIPE SUPPORTS ARE NOT SHOWN. SUPPORTS TO BE DESIGNED BY THE CONSULTING ENGINEER AND SUPPLIED BY THE INSTALLING CONTRACTOR. DO NOT SUPPORT PIPING OR OTHER STRUCTURES FROM THE TANK OR TANK PROJECTIONS.

4.) DESIGN AND APPLICATION FEATURES ARE DESCRIBED IN TYPICAL SPECIFICATION SHEETS, TECHNICAL DATA SHEET, FLOW SCHEMATIC, ELECTRICAL DIAGRAM AND ELECTRICAL SCHEMATIC. ARRANGEMENT SHOWN IS FOR BELOW-GRADE FINISHED WATER STORAGE.

5.) THE STANDARD DESIGN IS FOR INDOOR INSTALLATION.

6.) CHECK VALVES OR BACKFLOW PREVENTERS ARE REQUIRED IN BACKWASH LINES AND FURNISHED BY OTHERS (NOT SHOWN ON DRAWING).

7.) AUTOMATIC RATE OF FLOW CONTROL LOOPS ON EACH INFLUENT LINE MAINTAIN THE PRE-SET FLOW TO EACH UNIT. INFLUENT FLOW SET POINT MAY BE SET BY THE PLANT OPERATOR USING THE OIT. INFLUENT FLOW CONTROL IS INTERLOCKED WITH FLUSH AND BACKWASH CYCLES.

8.) FILTER LIQUID LEVEL CONTROLLERS OPERATE FILTER EFFLUENT AND FILTER-TO-WASTE MODULATING VALVES TO MAINTAIN CONSTANT FILTER LEVEL.

9.) CONTROL CIRCUITS PROVIDE FOR AUTOMATIC FLUSH AND BACKWASH CYCLE WITH RETURN TO OPERATING SERVICE, INITIATED BY TIME CLOCK, HIGH HEADLOSS, OR MANUAL PUSHBUTTON.

10.) THREE LEVEL SWITCHES WITH DRY CONTACTS SHOULD BE PROVIDED BY THE CUSTOMER AND INSTALLED IN THE FINISHED WATER STORAGE TANK FOR THE AUTOMATIC OPERATION OF THE TRIDENT UNITS. ONE HIGH LEVEL SWITCH WILL STOP THE UNITS, ONE MID LEVEL SWITCH WILL START THE UNITS AND ONE LOW LEVEL SWITCH WILL SERVE AS A MINIMUM LEVEL TO ENABLE THE BACKWASH PROCESS.

11.) THE HIGH LEVEL STOP AND THE MID LEVEL START SWITCHES SHOULD BE INSTALLED WITH SUFFICIENT VOLUME BETWEEN THEM TO PREVENT EXCESSIVE CYCLING OF THE TRIDENT UNITS.

12.) THE LOW LEVEL BACKWASH ENABLE SWITCH SHOULD BE INSTALLED WHERE THE MINIMUM VOLUME IN THE BACKWASH SUPPLY TANK IS ADEQUATE TO PROVIDE A BACKWASH WITHOUT PULLING AIR INTO THE BACKWASH SUPPLY PUMP. THE MAXIMUM WATER TEMPERATURE SHOULD BE CONSIDERED WHEN CALCULATING THE MINIMUM BACKWASH VOLUME OR LEVEL IN THE TANK.

13.) AIRWASH BLOWER (TWO PROVIDED BY WESTECH ENGINEERING) AND BACKWASH SUPPLY PUMP (BY OTHERS) ARE NOT SHOWN.

14.) AIR COMPRESSOR (BY OTHERS) FOR VALVE OPERATION IS NOT SHOWN.

15.) AN AIR RELEASE VALVE (BY OTHERS) IS REQUIRED AT HIGH POINTS OF THE BACKWASH SUPPLY LINE TO VENT ACCUMULATED AIR. THE VALVE(S) ARE TO BE SIZED TO ALLOW THE COMPLETE VOLUME OF THE BACKWASH LINE FROM SOURCE TO FILTER, TO BE VENTED IN 20 SECONDS WITH DIFFERENTIAL OF APPROXIMATELY 10 PSIG, AND BE CAPABLE OF CONTINUOUSLY VENTING ACCUMULATED AIR. FOR INSTALLATIONS UTILIZING VERTICAL TURBINE OR "CAN-TYPE" PUMPS, A SEPARATE "TURBINE AIR VALVE" IS REQUIRED TO VENT THE AIR CONTENTS OF THE PUMP COLUMN WITHOUT LETTING THE AIR INTO THE BACKWASH PIPING.

16.) TANKS ARE FURNISHED WITH FINISH COATING SUITABLE FOR POTABLE WATER APPLICATIONS ON INTERIOR; UNIVERSAL PRIMER ON EXTERIOR. TANK BOTTOM IS UNPAINTED FOR INSTALLATION ON COAL TAR OR ASPHALTIC TYPE BASE MASTIC COMPOUND (BY OTHERS). TANKS SHOULD BE LEVEL WITHIN ONE EIGHTH INCH AT TIME OF INSTALLATION.

17.) OPTIONAL EQUIPMENT TO SUIT PROJECT REQUIREMENTS IS AVAILABLE. TYPICAL PROCESS EQUIPMENT OPTIONS INCLUDE:
- A) ALTERNATE OR ADDITIONAL CHEMICAL FEED SYSTEMS.
- B) RAW WATER TURBIDITY MONITORING.
- C) INFLUENT IN-LINE STATIC MIXER.
- D) INFLUENT STREAMING CURRENT DETECTOR.
- E) pH MONITIOR.
- F) PLATFORM/WALKWAY CLIPS.
- G) AIR COMPRESSOR FOR VALVE OPERATION.

18.) CONSULT WESTECH ENGINEERING FOR OTHER INFLUENT FLOW CONTROL OPTIONS.

19.) LOCATION OF FLOW METERS ARE TO BE PER FLOWMETER MANUFACTURER'S WRITTEN RECOMMENDATIONS CONFIRMED BY THE CONSULTING ENGINEER.

20.) INFLUENT OPERATING PRESSURE REQUIRED FOR CONTROLLING INFLUENT FLOW MUST BE 20 FEET MINIMUM AT THE TANK CONNECTION. FOR INFLUENT PRESSURE OVER 35 FEET OF HEAD, CONTACT WESTECH ENGINEERING. OPTIONAL STATIC MIXER WILL REQUIRE ADDITIONAL PRESSURE.

21.) DRY, FILTERED, COMPRESSED AIR, 1 SCFM PER TANK, FREE AIR AT 80 PSIG MINIMUM DISCHARGE PRESSURE IS REQUIRED TO OPERATE PNEUMATIC INSTRUMENTATION AND AUTOMATIC CONTROL VALVES. AIR COMPRESSOR AND RESEVOIR (BY OTHERS) SHOULD BE SIZED TO PREVENT EXCESSIVE CYCLING.

22.) WASTE SUMP AND SUMP PIPING (BY CUSTOMER) MUST BE SIZED TO GIVE FREE DISCHARGE WITH AN AIRBREAK, FOR MAXIMUM WASTE FLOW.

23.) WASTE TROUGH LIP IS POSITIONED ABOVE THE NORMAL OPERATING WATER LEVEL AND BELOW THE TOP OF THE TANK. THIS ALLOWS IT TO ACT AS AN EMERGENCY OVERFLOW.

24.) TANK CONNECTIONS ARE FURNISHED GROOVED FOR GROOVED STYLE FLEXIBLE COUPLINGS, WITH THE EXCEPTION OF AIR CONNECTIONS. COUPLINGS AND/OR FLANGE ADAPTERS ARE BY OTHERS.

25.) TRIDENT MODEL TR-420A TANKS REQUIRE APPROXIMATELY 5.9 CUBIC YARDS OF FILL CONCRETE IN FILTER PLENUM AREA. FILL CONCRETE AND UNDERDRAIN GROUT ARE BY OTHERS.

26.) PLANT CONTROL PANEL AND CHEMICAL FEED ASSEMBLIES NOT SHOWN.

WESTECH

TITLE **GENERAL ARRANGEMENT, TR-420A, AA**
TRIDENT® TR-420A WATER TREATMENT SYSTEM

DESIGNER	CHECKER	APPROVER	DATE	
BA91	SH40	JA20	2012-06-04	
DOCUMENT NUMBER			SHEET	REV
9001084000			4 OF 4	-

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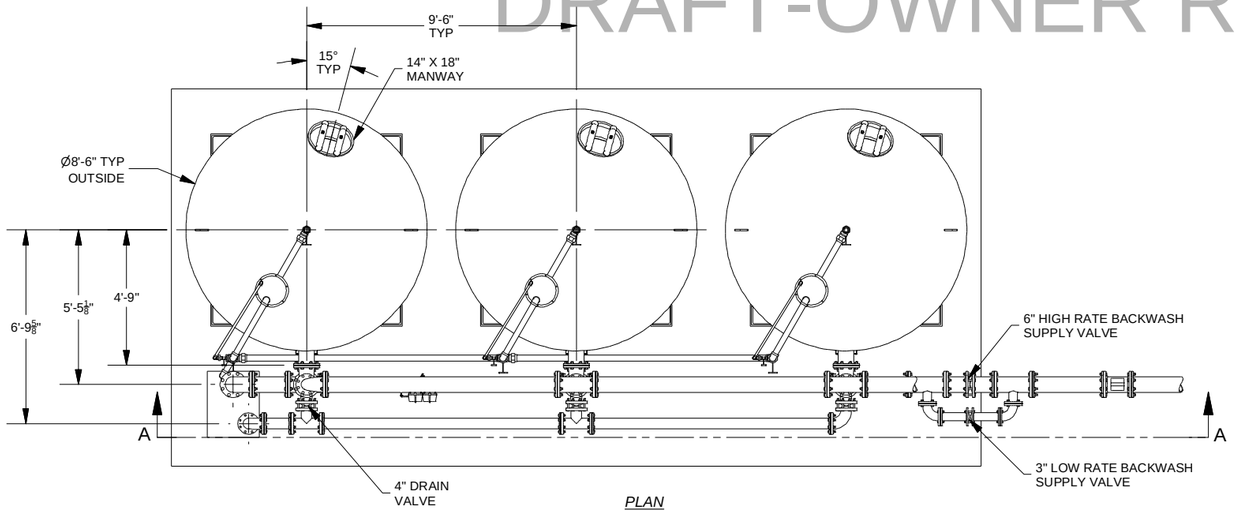
NOTES:

1.) FOLLOW THE LISTED WESTECH REFERENCE DOCUMENTS EXCEPT AS NOTED ON THIS DRAWING.

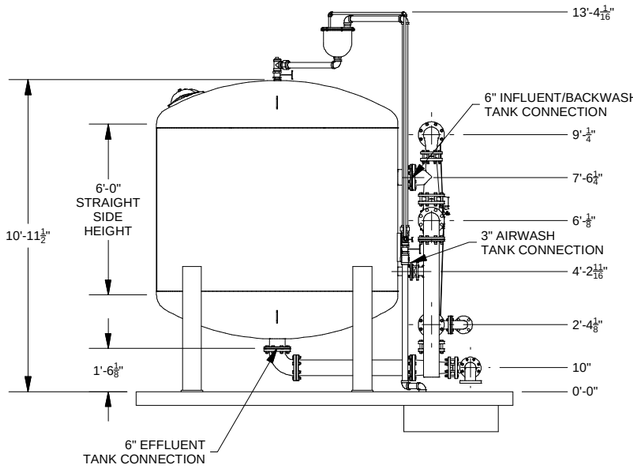
2.) EQUIPMENT FURNISHED BY WESTECH IS DESCRIBED IN A SEPARATE EQUIPMENT LIST. ADDITIONAL PIPING, PIPE SUPPORTS, AND CONNECTION FITTINGS ARE NOT INCLUDED WITH STANDARD UNIT. MAJOR EQUIPMENT AND COMPONENTS TO BE INSTALLED AT THE JOBSITE BY THE INSTALLING CONTRACTOR.

3.) EQUIPMENT CONCRETE DESIGN IS THE RESPONSIBILITY OF THE CONSULTING ENGINEER.

4.) PIPE SUPPORTS ARE NOT SHOWN. SUPPORTS TO BE DESIGNED BY THE CONSULTING ENGINEER AND SUPPLIED BY THE INSTALLING CONTRACTOR. DO NOT SUPPORT PIPING OR OTHER STRUCTURES FROM THE TANK OR TANK PROJECTIONS.



PLAN



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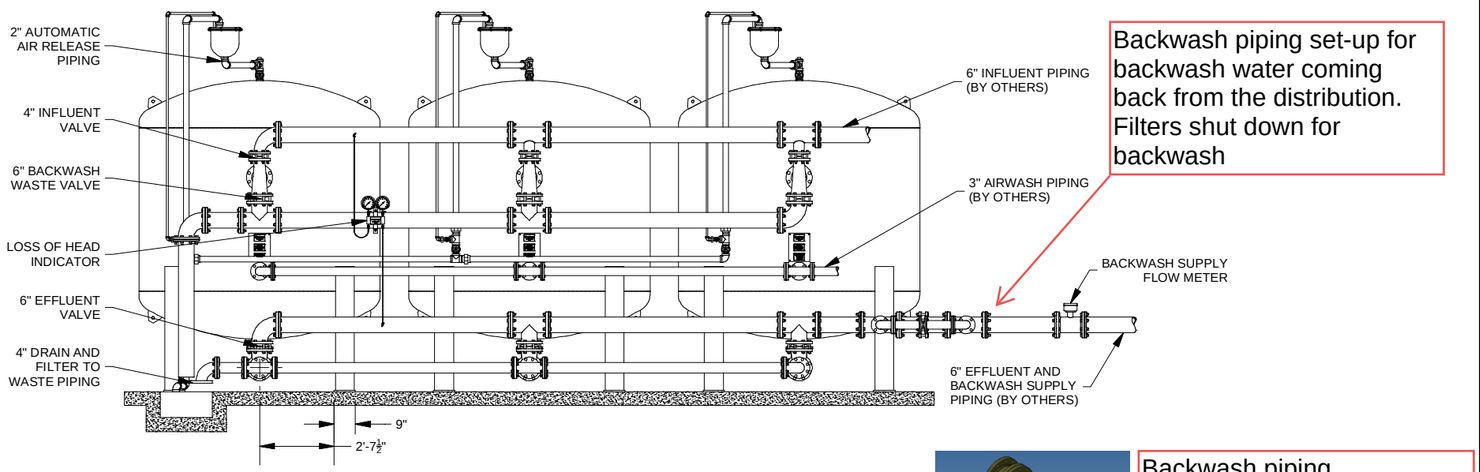
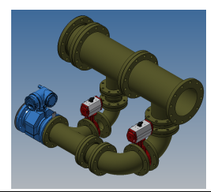


SECTION A-A

Backwash piping set-up for backwash water coming back from the distribution. Filters shut down for backwash



Backwash piping amendment for backwash supply from in-service vessels. Orifice plates may also be needed depending on pressures.

ADDITIONAL NOTES:

1.) EQUIPMENT FURNISHED BY WESTECH IS DESCRIBED IN A SEPARATE EQUIPMENT LIST. ADDITIONAL PIPING, PIPE SUPPORTS, AND CONNECTION FITTINGS ARE NOT INCLUDED WITH STANDARD UNIT. MAJOR EQUIPMENT AND COMPONENTS TO BE INSTALLED AT JOBSITE, BY CUSTOMER.

2.) WHEN PRESSURE AERATION OCCURS BEFORE FILTRATION THERE NEEDS TO BE A PROVISION MADE FOR AIR RELEASE IN THE HIGHEST POINT OF THE INLET
PIPING.

3.) EQUIPMENT CONCRETE DESIGN IS THE RESPONSIBILITY OF THE CONSULTING ENGINEER.

4.) PIPE SUPPORTS ARE NOT SHOWN. TO BE DESIGNED BY THE CONSULTING ENGINEER AND SUPPLIED BY THE INSTALLING CONTRACTOR.

5.) DO NOT SUPPORT PIPING OR OTHER STRUCTURES FROM THE TANK OR TANK PROJECTIONS.

6.) MINIMUM RECOMMENDED CEILING HEIGHT: ALLOW 6" CLEARANCE ABOVE THE AIR RELEASE PIPING.

7.) BACKWASH WASTE SUMP SIZING AND LOCATION DESIGN IS BY THE CONSULTING ENGINEER. SUMP TO BE DESIGNED FOR MAXIMUM DESIGN BACKWASH RATE.

Notes:

Each filter to backwash consecutively.

Four filters have been proposed.

REV	REVISION DESCRIPTION	ECN	DESIGNER	APPROVER	DATE

REFERENCE DOCUMENTS

WESTECH

TITLE **VERTICAL PRESSURE FILTER**
GENERAL ARRANGEMENT
8'-6" DIAMETER, 72" STRAIGHT SIDE, 3 TANK, MULTIWASH

DESIGNER	CHECKER	APPROVER	DATE
BA91		JA20	2014-10-28

DOCUMENT NUMBER	SHEET	REV
9001481000	1 OF 1	-

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DRAFT-OWNER REVIEW

Trident®

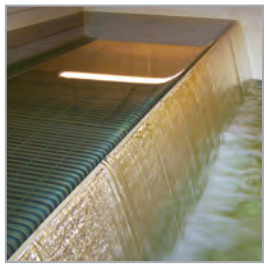
Package Water Treatment System

microfloc

The Trident® Package Water Treatment System

When Microfloc™ products first introduced the Trident technology, it represented a significant advancement in water and wastewater treatment for plant owners and operators. Not only did it remove turbidity, suspended solids, color, iron, manganese, odor, taste, and pathogens such as Giardia lamblia and Cryptosporidium, but it did so at a lower capital cost than conventional systems, in a smaller space, and at higher flow rates per unit area.

Today, more than 800 Trident technology systems, large and small, are at work all across North America and the world. Our Trident systems continue to evolve as we constantly strive to find ways to produce even higher quality treated water at higher flow rates per unit area and further reduce installation and operating costs.



Surface Water Treatment

- **Turbidity reduction**
- **Color removal**
- **Reduction of High TOC/DBP precursors**

Groundwater Treatment

- **Iron and manganese removal**
- **Arsenic**
- **Groundwater under the influence of surface water**

Tertiary Treatment

- **Water reuse**
- **Phosphorus removal**

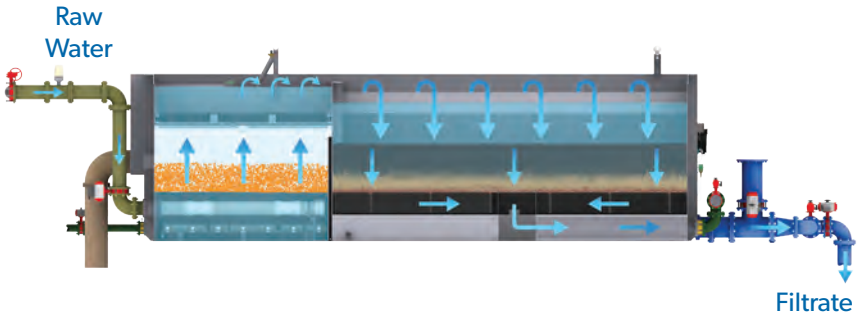
Industrial Process Water

Trident Design Criteria		
	Raw Water	**Finish Water**
Turbidity (NTU)	< 75	< 0.1
True Color (Pt-Co Units)	< 35	< 5
Combined Turbidity + Color	< 75	
Iron & Manganese (mg/L)	< 10	< 0.3 / 0.05

Proven and Efficient

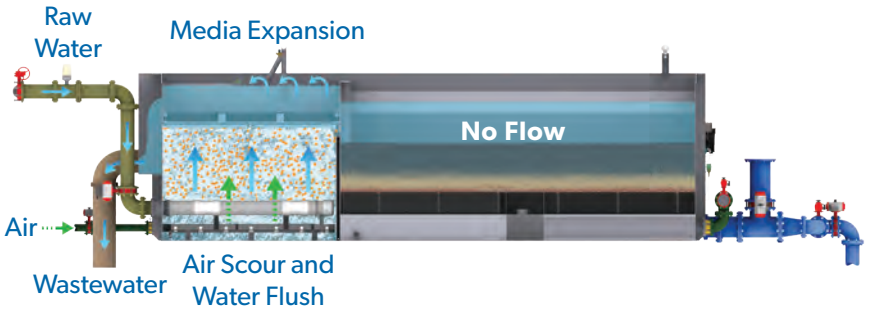
The Trident water treatment system utilizes a two-stage configuration consisting of an up-flow buoyant bead and compressible media Adsorption Clarifier® system followed by a conventional down-flow mixed media filter to produce high quality water.

Filtration Mode



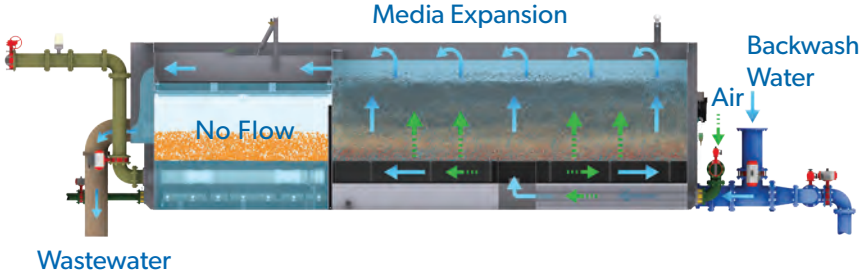
The treatment process is started when chemically dosed raw water enters the Adsorption Clarifier near the bottom of the tank where an upflow treatment process combines flocculation and clarification. From the Adsorption Clarifier, flow continues over a weir into the collection trough where it is distributed into the mixed media filtration chamber, after which it is collected by the MULTIBLOCK® underdrain with Laser Shield™ media retainer and exits the tank.

Buoyant Media Flush Mode



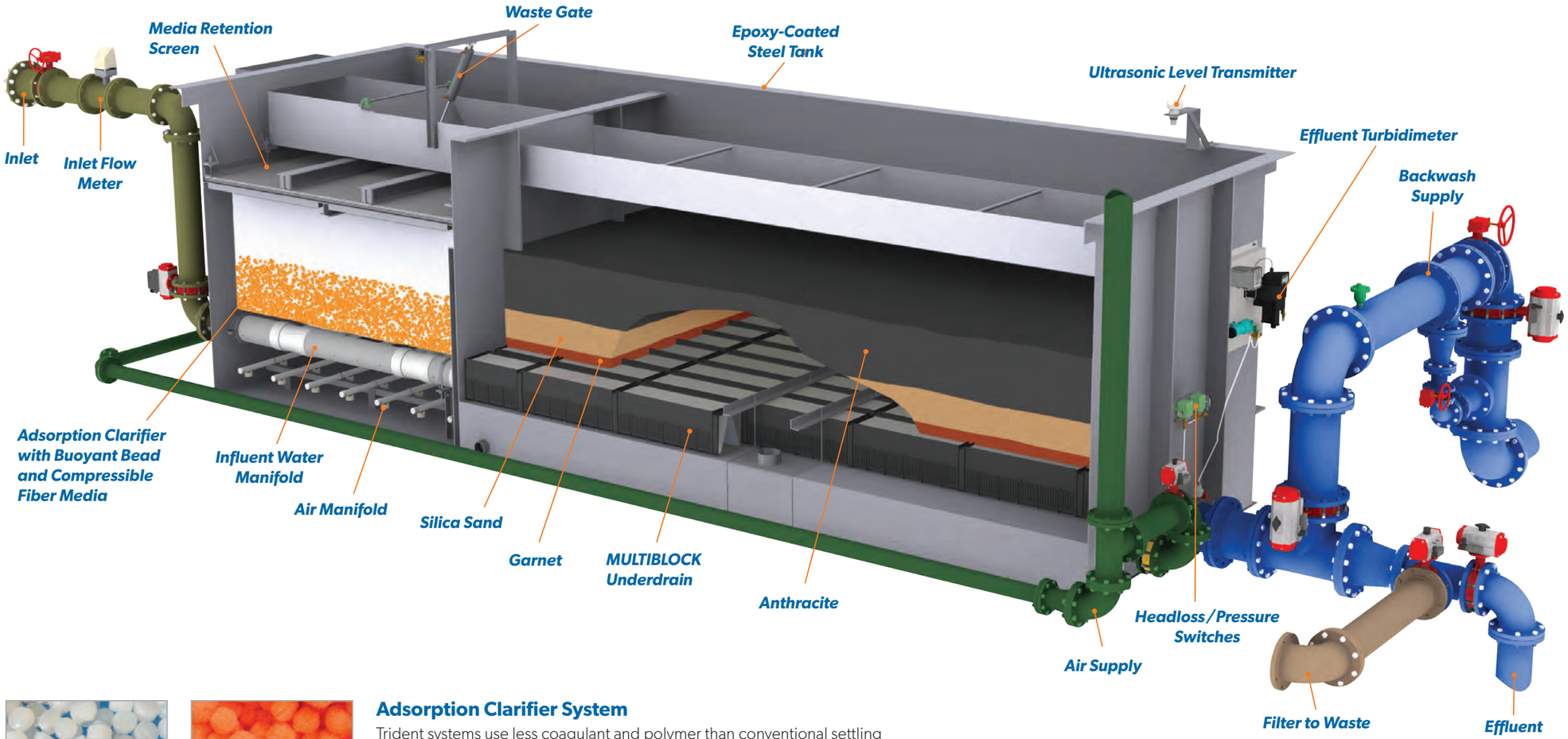
The Adsorption Clarifier is engineered to automatically initiate a flush cycle once headloss indicates that cleaning is required. When the cleaning is initiated, the waste gate and air scour valves are opened as raw water continues to flow. The air/water flush aggressively separates and removes the solids from the media. Solids are then discharged out through the waste pipe.

Backwash Mode



Like the Adsorption Clarifier flush, the backwash cycle is initiated when dirty bed headloss is reached in the mixed media filter section. The Trident inlet and outlet valves are closed and the air scour valve is opened to allow an air scour cycle. Solids from the backwash are then removed by water flowing up into the collection trough and discharged out through the waste pipe. A filter-to-waste sequence follows to ripen the filter media before returning the unit to service.

Complete Package Plant



Standard Components
Epoxy-coated steel tanks
Media
Internals
Actuated and manual valves
Inlet magnetic flow meter
Pressure transmitters
Ultrasonic level transmitter
Effluent turbidimeter
Automated PLC controls
Backwash control valves
Blower package
Chemical feed packages (coagulant and polymer)

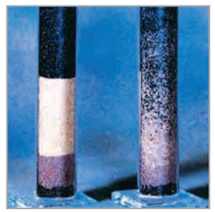
Optional Components
Air compressor package
Integrated plant PLC controls package
Backwash magnetic flow meter
Interconnecting walkways and platforms
Aluminum or stainless steel tanks
Inlet turbidimeter
pH monitor
Streaming current monitor
Static mixer

Adsorption Clarifier System

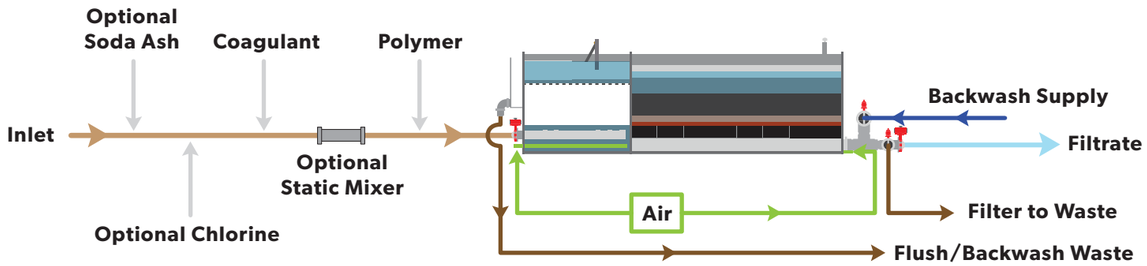
Trident systems use less coagulant and polymer than conventional settling type clarifiers. Within the Adsorption Clarifier system it is not necessary to form a settleable floc, which means floc size and settling time are not factors. The buoyant media is rolled and scarified to greatly improve particulate removal. The compressible fiber media is used to capture more solids. The buoyant and compressible fiber media are NSF-61 certified and typically will last the life of the system.

Mixed Media Filtration

Microfloc pioneered mixed media technology, which has become the industry filtration standard. By using three or more granular materials of differing size and specific gravity, the progressive coarse-to-fine mixed media produces superior quality finished water.



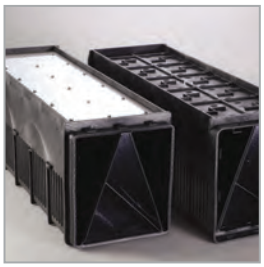
Trident Process Flow Diagram



Highly Efficient, Simple Operation

MULTIBLOCK

MULTIBLOCK underdrains provide a high-quality, low-cost, engineered product that is economical and versatile. MULTIBLOCK underdrains are fitted with the unique Laser Shield media retaining system that eliminates the need for support gravel. Combined air and water backwash is provided using this system.



- **Reduced profile underdrain**
- **Superior media retention capability**
- **Uniform distribution of water and air backwash**
- **NSF-61 approved**
- **Resistant to plugging and fouling**

Trident Process Controller Including the AQUARITROL® III

Trident package treatment units are supplied with fully automated programmable logic controls (PLC). These controls allow plant personnel to easily monitor operational parameters and control all treatment equipment and processes.

Changes in raw water characteristics and flow rate are automatically detected by the AQUARITROL III program. This PLC-based, feed-forward, loop control system monitors the filter effluent quality and continually evaluates and regulates influent chemical feed to maintain desired effluent water quality parameters. The operator sets an adjustable effluent quality setpoint and the Trident controls, utilizing the AQUARITROL III program, do the rest.

WesTech's electrical engineers and programmers can also integrate new whole plant operation or existing plant instruments into the Trident PLC controls. Complicated plant expansions are simplified by providing seamless integration of new and existing equipment.

- **Optimized and flexible process controls**
- **Chemical usage is maximized while maintaining performance**

Get More with Microfloc

Big Performance in a Small Water Treatment System

For lower flows, Microfloc offers the Tri-Mite® Package Water Treatment Plant. Using the same process as the Trident system, the Tri-Mite comes factory-assembled with pumps, controls, piping, valves, and an air scour blower mounted on the tank. These items are pre-plumbed and wired for simple, fast installation.

The Tri-Mite unit is available in five standard sizes as single units from 50 gpm to 350 gpm and as a two-unit system up to 700 gpm capacity. For flows less than 50 gpm, a single unit can be operated on an intermittent or reduced flow basis. These systems are perfect for new designs with future expansion in mind. The future additional tank would share the control panel, blower, and backwash pump of the first tank.

Equipment Upgrades and Expansions

If your unit is more than 10 years old, or has seen changes in raw water quality, it may be worthwhile to inquire about upgrading your Trident system. Common upgrades include enhanced PLC control systems, underdrain replacement accompanied with backwash upgrade, Trident HSR integrated presedimentation systems, and replacement of up-flow media. Retrofits are also available for other package treatment systems.

Stretch Customization

Some regulatory requirements may dictate a lower hydraulic loading through the filter cell. This is a simple change for the Trident system. An optional stretch filter cell is available to lower the hydraulic loading rate from 5 gpm/ft^2 to 4 gpm/ft^2. Other filter loading rates may also be achieved through custom design.

Standard Sizes

		Tri-Mite					Trident			
Influent Flow Rate GPM		**50**	**75**	**100**	**175**	**350**	**175**	**350**	**700**	**1400**
Tank Dimensions (Shipping)	Length	9 ft 0 in	9 ft 2 in	11 ft 2 in	13 ft 9 in	23 ft 2 in	10 ft 1 in	14 ft 6 in	27 ft 10 in	39 ft 10 in
	Width	5 ft 8 in	7 ft 10 in	7 ft 8 in	9 ft 11 in	10 ft 2 in	6 ft 11 in	8 ft 11 in	8 ft 11 in	11 ft 11 in
	Height	8 ft 5 in	8 ft 6 in	8 ft 6 in	8 ft 2 in	8 ft 3 in	8 ft 5 in	8 ft 5 in	8 ft 5 in	10 ft 1 in
Weights	Shipping (lbs)	6,300	8,100	9,600	9,200	14,600	7,000	10,250	17,000	34,000
	Operating (lbs)	14,000	20,000	25,000	43,000	78,000	35,000	70,000	140,000	330,000
Tank Connections	Influent	2 in	3 in	3 in	4 in	6 in	4 in	6 in	8 in	12 in
	Effluent	2 in	3 in	3 in	4 in	6 in	6 in	8 in	12 in	16 in
	Backwash Supply	3 in	4 in	4 in	5 in	8 in	6 in	8 in	12 in	16 in
	Waste/Overflow	4 in	6 in	6 in	8 in	10 in	8 in	10 in	14 in	20 in
	Air Wash (Clarifier)	1.5 in	2 in	2 in	2 in	3 in	2 in	3 in	4 in	6 in
	Air Wash (Filter)	1.5 in	2 in	2 in	2 in	3 in	3 in	4 in	6 in	8 in
Waste Production	Flushing Flow Rate (gpm)	50	75	100	175	350	175	350	700	1,400
	Flushing Volume Per Cycle (gal)	500	750	1,000	1,750	3,500	1,750	3,500	7,000	14,000
	Mixed Media Per Cycle (gal)	900	1,350	1,800	3,150	6,300	3,500	7,000	1,4000	28,000
	Filter to Waste Per Cycle (gal)	250	375	500	875	1,750	875	1,750	3,500	7,000

DRAFT-OWNER REVIEW

microfloc

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