WELLS 3 & 4 WATER TREATMENT PLANT PRELIMINARY DESIGN REPORT

Town of Medfield, Massachusetts

May 2020

ENVIRONMENTAL PARTNERS

ENVIRONMENTAL PARTNERS

EXECUTIVE SUMMARY

The Town of Medfield (Town) retained the services of Environmental Partners to complete a Preliminary Design for the proposed Well 3 & 4 Water Treatment Plant. The scope of work included geotechnical site investigation; site survey; wetland flagging; research and investigation into major project disciplines including architectural, civil, structural, process mechanical, mechanical (HVAC), electrical, plumbing, instrumentation and controls, and permitting; preliminary design of a site plan and building layout; development of opinion of probable construction costs; and preparation of a preliminary design report (PDR), herein attached. The PDR presents the results and conclusions of the preliminary design phase for the proposed facilities associated with the water treatment plant. The report builds upon the prior studies and work completed by Environmental Partners, and incorporates feedback from various representatives and officials from the Town, Town's SCADA Integrator, regulatory agencies, and utility providers.

INTRODUCTION AND BACKGROUND

Wells 3 and 4 are registered public water sources with a Massachusetts Department of Environmental Protection (MADEP) issued registered withdrawal rate of 0.92 million gallons per day (MGD). Well 3 has a reported safe yield of 1.2 MGD and Well 4 has a safe yield of 1.01 MGD. The Town has not been utilizing Well 4 for several decades due to water quality concerns and MADEP has requested that Well 4 be evaluated for potential groundwater under direct influence of surface water due to the proximity of Mine Brook before it is returned to service.

Based upon discussions with MADEP, Well 3 is located within a non-conforming Zone I wellhead protection area due to the presence of the active railroad within 400 feet of the well. Well 3 has been operating at diminished capacity (approximately 0.54 MGD maximum) due to hydraulic restrictions of the replacement well screen installed in the early 2000s. Under the terms of the new source approval process, the approval process for replacing Well 3 can be streamlined if it is replaced within 50-feet of its current location. Environmental Partners new source testing completed in 2017 found that a replacement well could be sited within 50-feet of the existing well and preliminary testing indicated the aquifer capacity met the existing 1.2 MGD withdrawal capacity of Well 3 and the potential for additional withdrawal capacity. MADEP has reported that requesting any additional withdrawal capacity from a replacement Well 3 would be unlikely due to the non-conforming Zone I.

The Town received approval of the Well 3 Pilot Study from the MADEP in April 2019. The MADEP approved the iron and manganese treatment system for use of sodium hypochlorite for iron/manganese treatment and disinfection, sodium hydroxide for pH adjustment, and

iron/manganese treatment using pressure filtration at filter loading rates up to 9 gallons per minute per square foot. Well 4 was not included within the scope of the pilot study.

Based on these recent findings regarding the Pilot Study and Well 3 replacement well, the Town contracted Environmental Partners to evaluate Well 4 for potential surface water influence, identify potential areas at the wellfield for further new source testing within a conforming Zone I area, and update the preliminary treatment system requirements and opinion of probable construction cost for the Well 3 treatment facility to reflect the MADEP approved treatment criteria and Town's capital planning schedule.

PURPOSE, SCOPE, OBJECTIVES

The ultimate purpose and intent for completing the preliminary design phase was to advance the process of construction a new water treatment plant in an efficiency and effective manner. The scope of the project included the identification and development of critical design decisions and issues associated with the following categories:

- Hydraulics
- Civil/Site
- Geotechnical
- Process Mechanical
- Instrumentation and Controls
- Architectural and Building Code Review
- Structural
- Mechanical, Electrical, and Plumbing

The objective of this project is to build upon the previous work completed by Environmental Partners and to assimilate feedback from the Town. It is the intent of this report to describe in detail the framework for a new treatment plant, including the identification and documentation of project constraints which have already been established, as well as project decisions to be made in the immediate future during the final design process.

SUMMARY OF PRELIMINARY ENGINEERING AND PLANNING

Comprehensive technical memoranda which describe the detailed preliminary engineering and planning are provided as attachments to this report. A list of the attached preliminary design technical memoranda for the water treatment plant is presented below:

- Attachment 1 – Hydraulics

- Attachment 2 – Civil/Site
- Attachment 3 – Geotechnical
- Attachment 4 – Process Mechanical
- Attachment 5 – Instrumentation and Controls
- Attachment 6 – Architectural
- Attachment 7 – Structural
- Attachment 8 – Mechanical, Electrical, and Plumbing
- Attachment 9 – Permitting
- Attachment 10 – Opinion of Probable Costs
- Attachment 11 – Preliminary Drawings

This section of the report presents a summary of the water treatment plant preliminary design and planning effort.

The proposed water treatment plant shall be rated for an average flow of 1.5 million gallon per day (MGD) with a maximum flow capacity of 2.21 MGD. The proposed facility will be located northwest of Well 3 in a mainly wooded area owned by the Town. The Town currently maintains an access drive off of Elm Street at 43 Elm Street, Medfield, MA that leads to Well houses 3 and 4. The existing 18-foot access road from Elm Street shall remain and all vehicles shall access the water treatment plant through this existing roadway. The site will include an approximate 6,000 square foot pre-engineered building with slab on grade, site fencing enclosing both the building and stormwater bioretention area, and wrap around site access for a WB-40 intermediate semi-trailer truck (to accommodate a fire truck or chemical deliveries). The area around the building will be paved and six parking spaces will be provided, including one handicap accessible space. The stormwater management system was designed to incorporate low impact development (LID) site design concepts. Runoff from the building area will be directed to swales for treatment and conveyance to a proposed bioretention area. Runoff from the building's metal roof will be directed to the swales for treatment.

A new production well installed at Well 3 and raw water from Well 4 will be pumped via 8-inch and 12-inch mains to the new facility. Existing mains will be used to the maximum extent practicable; however, a new 8-inch transmission main will be required to bring raw water from Well 4. The two 8-inch raw water mains will combine in the water treatment plant driveway and become a single 12-inch raw water main that enters at the southwest corner of the building. A 12-inch finished water pipe exits the facility and connects to the existing 12-inch finished water main at the intersection of the plant driveway and access road.

Raw water will enter the building at the chemical storage areas and be treated with sodium hydroxide for pH adjustment and sodium hypochlorite for disinfection and oxidation. The oxidized water will be distributed to four vertical pressure filters containing anthracite, GreensandPlus™ media, and gravel for the removal of iron and manganese. Filter effluent water will flow back through the chemical rooms for any final chemical addition, and then into the distribution system. Piping was sized to

provide sufficient contact time for 4-log inactivation of viruses before the first customer. The Well 3 and 4 pumps will deliver pressurized water from the wells, through the filters, and into the distribution system, and therefore no intermediate pumping is required.

Each filter will be backwashed approximately every three to four days. Backwash water will typically be provided from the other operating filters and will discharge to the below grade backwash waste tank. The backwash waste will be pumped to the Town's sewer system via a force main to be installed by the Town. An air scour blower will provide pressurized air for the air/water filter backwash sequence which is completed once per week in lieu of the water only backwash.

Regulation regarding the concentration of polyfluoroalkyl substances (PFAS) is expected to be enacted by MADEP in late 2020. Current guidance and other state regulations require PFAS removal down to 20 parts per trillion. Space is provided in the facility for three future lead-lag granular activated carbon (GAC) vessel units, capable of adequately treating between 1,000 to 1500 gpm depending on PFAS concentrations and final regulatory treatment standards. Additional vessels could be provided outside the footprint of the building if required. GAC filtration for PFAS removal would take place after iron and manganese removal filtration to provide maximum carbon bed life by removing raw water iron and manganese. The building design includes provisions for three knock-out walls located on the eastern side of the facility for the installation of the future GAC contactors.

The treatment systems are housed in a pre-engineered building with concrete base slab and below grade tank for backwash waste. The building will include three distinctive areas, a "controls area" and "chemical storage area" in the front of the building, and a "process area" in the rear of the building. A roll-up bay door will allow for large deliveries into the process area in the rear of the building. The process area will comprise most of the floor area in the building and include the vertical pressure filters, piping, pumps and motors, air scour blower, and future GAC filter area. The process area will be heated during the winter and dehumidified year-round.

The controls area includes a control room/laboratory, an ADA accessible toilet, mechanical room, and electrical room. An upper level designed to house HVAC equipment will be located above the control room. The combined laboratory and control room will house the Main Control Panel, a desk with a computer terminal station, chemical resistant counter-top space, a sample sink, a general service sink, and a fume hood. The control room/laboratory will have year-round climate control (heating and air conditioning). The utility room will house a janitors sink, water heaters, plumbing, and fire protection equipment (if required); and the electrical room will include variable frequency drives, automatic transfer switch, and panelboards.

Chemicals will be stored in separate rooms to provide maximum operator protection and minimize heating and ventilation requirements. An upper level designed to house HVAC equipment will be located above the chemical rooms. The chemical storage rooms will consist of bulk and day tanks, which are housed in a recessed area designed to meet OSHA requirements for chemical containment. Chemical fill panels located outside the building adjacent to the chemical storage room will allow for monthly liquid chemical deliveries. The chemical systems are primarily designed for pre-filter oxidation and pH adjustment; however, additional day tanks, metering pumps, and injection locations are designed for supplemental post-filter chemical treatment if required. Online water quality analyzers will monitor pH, chlorine residual, and other parameters throughout the process. A

dechlorinating agent (sodium bisulfate) chemical storage room was included in the design for future installation to coincide with PFAS treatment. The chemical storage rooms were designed with double doors and removable handrails for future tank replacement.

The existing buildings at Well 3 and 4 will be rehabilitated including roof replacement, hazardous materials removal if found (asbestos), limited heating and ventilation modifications, and electrical improvements. The existing Well 3 pump will be demolished, and a new well (3A) will be drilled by the general contractor and provided with a variable speed submersible well pump. The 3A pump discharge will tie into the existing Well 3 piping system. The existing Well 4 pump will be demolished and replaced with a new variable speed vertical turbine pump.

The planning and conceptual engineering scope of work also included a comprehensive evaluation of regulatory permitting requirements. In addition to state building codes and local ordinances, the major permitting issues for the new facilities will include submittals for compliance with the following state environmental departments and regulations:

- Massachusetts Department of Environmental Protection (MADEP)
- Wetlands Protection Act/Conservation Commission
- Massachusetts Environmental Policy Act (MEPA)
- Town Site Plan Review (if required)

OPINION OF PROBABLE COSTS

Based on the preliminary design elements outlined above for the proposed Well 3 & 4 Water Treatment Plant, the opinion of probable constructions costs (OPCC) is approximately $10,340,000 (Spring 2021 bid). Note that approximately $1,350,000 (15%) is carried in contingencies. The OPCC provided in Attachment 10 includes a breakdown of costs by discipline. The materials and labor costs is estimated at approximately $7,000,000; and the remaining $3,300,000 balance includes Contractor general requirements; overhead and profit; escalation to bid and construction mid-point; bonding; and contingency. Due to Covid-19, potential materials and labor shortages could affect contractor pricing. However, the OPCC contingency reserve was based with consideration to the pandemic. The OPCC will be updated during the final design process and prior to bid.

The Town has committed to installing the 4-inch HDPE backwash waste forcemain from the treatment plant site to the sewer manhole on Elm Street. Additional items that could be self-performed by the Town and reduce overall construction costs include: clearing and grubbing; subgrade preparation and rough grading; water main construction; ductbank installation between the treatment plant and well sites; and paving. Value engineering considerations include reducing the footprint of the building by approximately 1,000 square feet to eliminate the future PFAS removal building space, and would equate to approximately $220,000 in savings.

PROJECT SCHEDULE

An implementation schedule including final design, permitting, bidding (filed sub-bids and general bid), and construction of the water treatment plant is outlined below. The schedule is based on typical permitting timeframes which may extend due to the Covid-19 pandemic. The design, permitting and bidding for the water plant will be completed prior to the Spring 2021 Annual Town Meeting. The project schedule includes a fifteen month construction duration. In order for the project to be successfully executed, final design and permitting of the proposed facilities should begin in earnest, as soon as practical. The anticipated project schedule is shown below.

Milestone/Task	Duration	Date
Preliminary Design		Complete
Final Design	6 months	June 2020 to November 2020
Permitting – MEPA and Conservation Commission	3 months	July 2020 to September 2020
Permitting – Site Plan Review	4 months	July 2020 to October 2020
Permitting – MADEP	3 months	December 2020 to February 2021
Bidding (Filed Sub-Bid and General)	2 months	Spring 2021
Spring Town Meeting		
Recommendation of Award/Notice of Award		
Notice to Proceed		July 2021
Construction	15 months	July 2021 to October 2022
Owner Occupancy of Facility		November 2022

ATTACHMENT 1

Hydraulics Technical Memorandum

ENVIRONMENTAL PARTNERS

TECHNICAL MEMORANDUM

Date: May 2020

To Maurice Goulet, Director of Public Works, Town of Medfield

From Eric Kelley, Project Manager, Environmental Partners

CC Paul Millett, Senior Principal, Environmental Partners
Dave Patangia, Principal, Environmental Partners
Tyler Schmidt, Project Engineer, Environment Partners

Subject Wells 3 & 4 Water Treatment Plant
Town of Medfield, Massachusetts
Hydraulics Technical Memorandum

This technical memorandum presents design information and details regarding the proposed hydraulic systems for the Wells 3 & 4 Water Treatment Plant (WTP). This technical memorandum includes a review and description of existing conditions and proposed design considerations related to plant capacity, backwash waste pumping, finished water pumping, well modifications, raw and oxidized water mains, and distribution water main improvements. The proposed layout of these systems is available in Attachment 11 – Preliminary Design Drawings.

EXISTING CONDITIONS

The Town of Medfield (Town) is currently experiencing declining source water quality across its wells. It relies heavily on Well 6, which is within the Charles River Basin, for approximately 50% of its annual water supply based upon 2014-2018 withdrawals. Well 4 has been offline since the late 1990s due to poor water quality, including elevated manganese concentrations. Wells 1 and 2 have required additional treatment for the removal of volatile organic compounds in the past. Well 3 provides up to 20% of the Town's water supply and was rehabilitated in 2015, but is operated at reduced capacity due to hydraulic limitations of the well's narrow screen. These water supply challenges limit the Town's flexibility in managing their water supplies and present risks to meeting peak demands in the event of either Well 6 or Well 3 not being in service. Table 1 below details the public water sources of the Town.

Table 1: Medfield Public Water Sources

Source	Age	Source Watershed	Chemical Treatment	Pump Type & Horsepower	Percent of total supply
Well 1 (Main Street)	1955	Charles	NaOH (50%) Bulk NaOCL (13%) Bulk	40 HP Vertical Turbine	8.0%
Well 2 (Main Street)	1959	Charles	NaOH (50%) Bulk NaOCL (13%) Bulk	75 HP Submersible	25.3%
Well 3 (Elm Street)	1967	Boston Harbor-Neponset	NaOH (50%) Bulk NaOCL (13%) Bulk	75 HP Vertical Turbine	19.3%
Well 4 (Elm Street) (OFFLINE)	1976	Boston Harbor-Neponset	Offline	75 HP Vertical Turbine	Offline
Well 6 (Route 27)	1996	Charles	NaOH (50%) Bulk NaOCL (13%) Bulk	125 HP Submersible	47.4%

The Town does not have any permanent emergency connections to surrounding communities, nor inter-municipal agreements in place to establish temporary connections in the event of an emergency. To reduce reliance on Well 6, the Town plans to replace Well 3 with an adjacent replacement well (well 3A); and to construct an iron and manganese removal facility to treat both the replacement Well 3A and existing Well 4. Figure 1 below shows a map of the Medfield Water System.

The average daily demand for the period between 2014 and 2018 was 1.33 MGD with a minimum daily demand of 0.79 MGD in November 2018 and a maximum daily demand of 2.16 MGD in July 2016. The Town's water supply wells are within the Charles River (Wells 1, 2 & 6) and Neponset River (Boston Harbor) basins (Wells 3 & 4), which are both classified as stressed basins by the Massachusetts Water Resources Commission. The Town's Water Management Act registered withdrawal volume is 1.5 MGD. Figure 2 below shows the monthly water consumption for the period between 2014 and 2018.

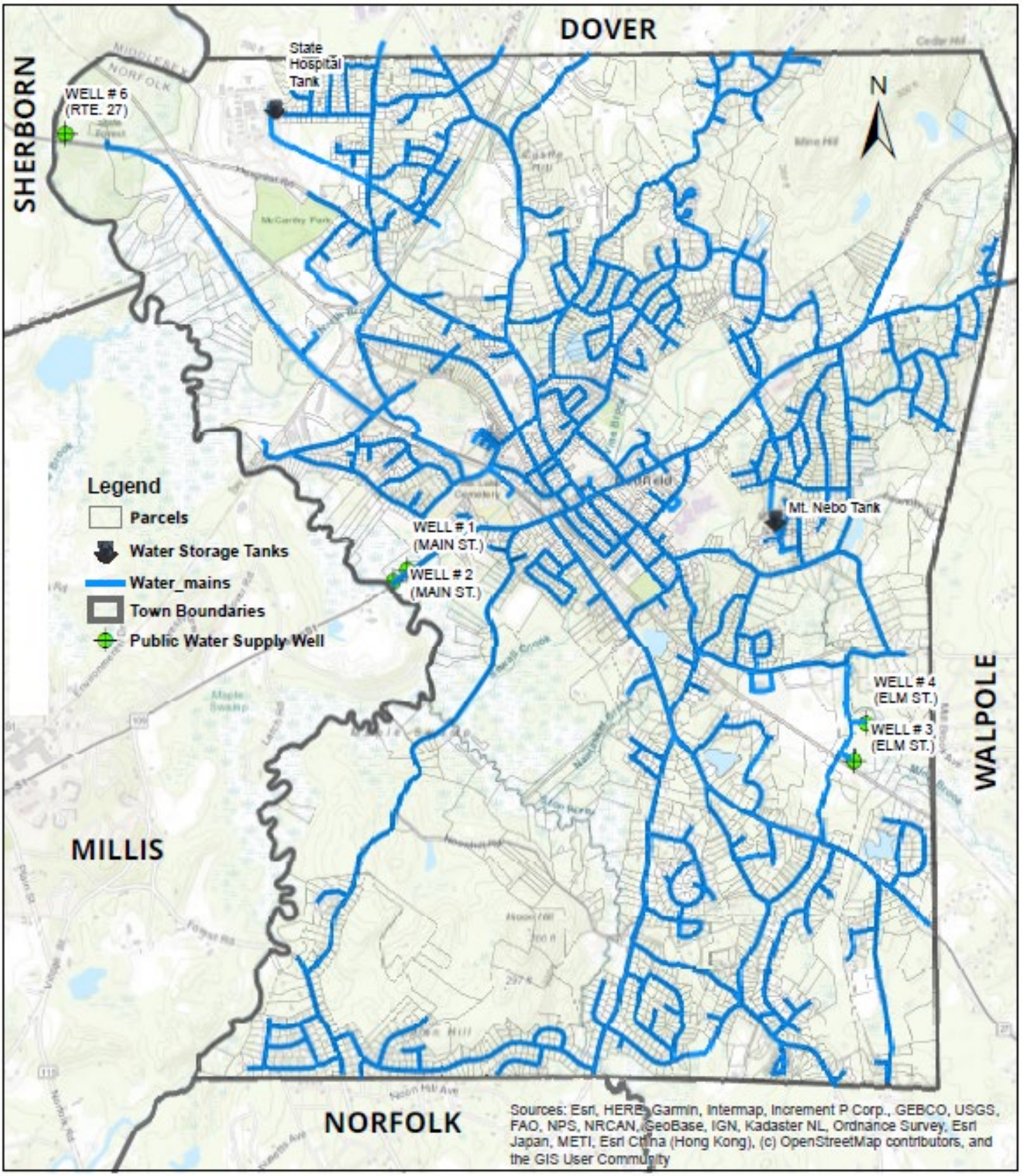
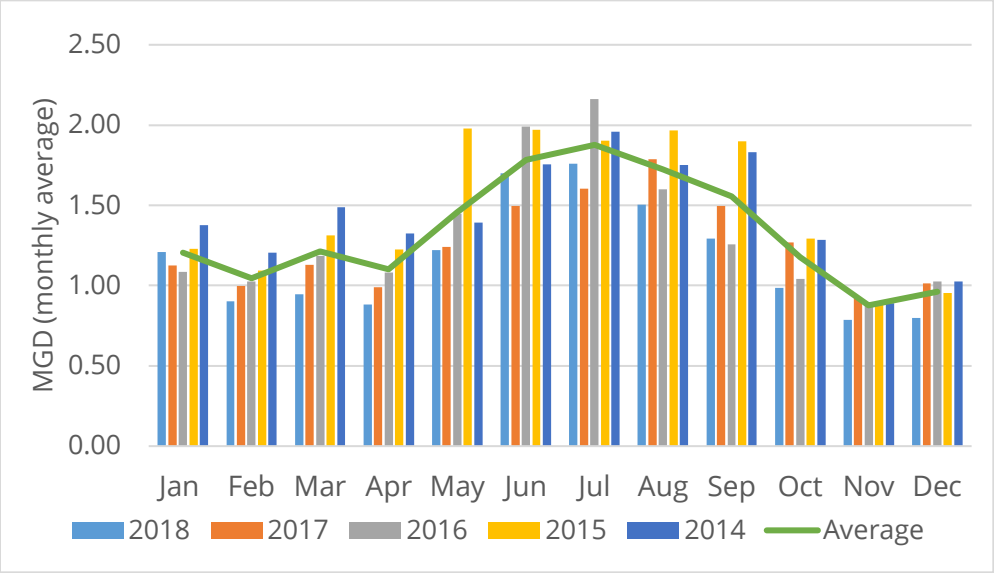


Figure 1
Medfield Water System
May 2020

0 0.5 1 Miles

Figure 2: Monthly Water Consumption 2014-2018



Currently, groundwater from Well 3 is chemically treated in the Well 3 building. The groundwater from Well 4 was also chemically treated in the Well 4 building, when active. Both stations discharge water through an 8-inch ductile iron main into the distribution system. Well 4 is not currently in use, as elevated source water manganese concentrations have forced the Town to suspend its use. Wells 3 & 4 have a combined MassDEP approved safe yield of 2.21 million gallons per day (MGD). Well 3A will have the same safe yield as Well 3, as noted in the EP Well 3 Replacement Memorandum dated March 2017. Table 2 includes the safe yield and average annual withdrawal capacity of each well between the years 2014-2018.

Table 2: Source Water Capacities of wells 3 & 4

Facility Name	DEP Approved Safe Yield (MGD)	Average Annual Withdrawal (MGD)
Well 3 (Elm Street)	1.2	0.29
Well 4 (Elm Street)	1.01	Offline

The existing condition of each well and its associated well pump is described in Table 3:

Table 3: Existing Well Configuration

Process	Parameter	Value	Unit
Well #3	Well Diameter	8	inches
	Well Depth	58.6	feet
	Well Screen Length	10	feet
	# of Pumps	1	
	Type of Pump	Vertical Turbine	
	Existing Pump Design Point	600 gpm @ 268 feet TDH	
	Existing Motor Size	75	HP
Well #4	Well Diameter	24	inches
	Well Depth	47	feet
	Well Screen Length	10	feet
	# of Pumps	1	
	Type of Pump	Vertical Turbine	
	Existing Pump Design Point	650 gpm @ 240 feet TDH[1]	
	Existing Motor Size	75	HP

[1]Existing Well 4 pump TDH to be confirmed during final design.

PROPOSED CONDITIONS

WELL MODIFICATIONS

In March 2017, Environmental Partners coordinated inspection and testing of source water facility equipment to identify any hydraulic issues that may impact the ability of the wells to provide raw water to the proposed WTP.

Environmental Partners investigated suitable replacements for Well 3. The screen in Well 3 has collapsed, and the original 18-inch well was relined with a 14-inch well screen in 2005 reducing pumping capacity. The Massachusetts Department of Environmental Protection (MADEP) Guidelines allow for locating a replacement well within 250 feet of a production well. If the replacement well is located within 50 feet of the existing production well, the permitting process with MADEP is streamlined.

Well 4 has been offline since 1990 due to poor water quality. The Town conducted microscopic particulate analysis (MPA) testing in winter 2019. Testing yielded a low probability of surface water influence. Environmental Partners recommends reactivating well 4, if additional MPA testing in Spring 2020 also yields a low probability of surface water influence.

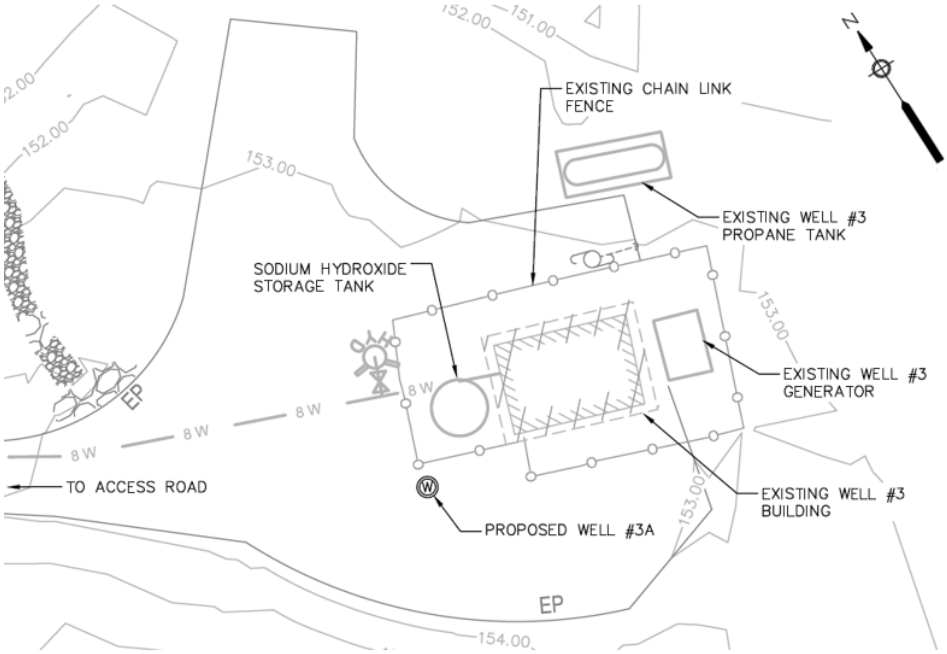
Photo 1: Well #3 Building

Photo 2: Well #4 Building

Wells 3/3A

In March 2017, Environmental Partners identified a replacement for well 3 approximately 15 feet to the southwest of the well 3 building, as shown in Figure 3 below. The well 3 building houses chemical feed systems for potassium hydroxide and sodium hypochlorite. The building also includes a flow meter, a pressure indicating transmitter (PIT), vertical turbine pump variable frequency drive (VFD), and associated control panels.

Figure 3: Proposed Location of Well #3A



A summary of the Well 3/3A modification recommendations is listed below:

- Demolition of the Well 3 pump and appurtenances;
- Demolition of existing chemical feed systems;
- Installation of the new Well 3A, new submersible pump, and appurtenances;
- Installation of a VFD for the Well #3A pump speed control;
- Installation of a new electromagnetic flowmeter;
- Installation of a new PIT on pump discharge;
- Installation of a well LIT; and
- Completion of ancillary Well building improvements including, roof replacement, painting, and HVAC upgrades.

Well 4

The Well 4 building includes a flow meter, a pressure indicating transmitter (PIT), and associated control panels. Underground chemical feed piping from well house 3/3A has been disconnected since Well 4 was taken out of service.

A summary of Well 4 modification recommendations is listed below:

- Redevelopment of the well;
- Replace existing well pump;
- Installation of a new VFD for Well #4 pump speed control;
- Installation of an electromagnetic flowmeter;
- Installation of a PIT on pump discharge;
- Installation of a well LIT and
- Completion of ancillary Well building improvements including, roof replacement, painting, and HVAC upgrades.

PLANT CAPACITY

Based on the existing DEP Approved safe yield for Wells 3A and 4 (refer to Table 2), the WTP shall treat an average flow of 1.5 MGD (1041 gpm) with a maximum flow of 2.21 MGD (1535 gpm). The flows are based on the WTP operating over a 24 hour period. A portion of the total raw well flow is required for backwashing the filters. The plant design includes capacity for the filters to run at average design flow and backwash a filter in tandem.

RAW AND OXIDIZED WATER MAIN

Raw water shall be pumped via the well pumps from Wells 3A and 4. The raw water sources blend before entering the WTP. The blended raw water enters the WTP in the southwest corner, where it

receives chemical treatment for pH adjustment and oxidation. An electromagnetic flowmeter records WTP influent flow. The required pre-oxidation contact time of 15 seconds shall be provided before the connection to the influent filter header. Oxidized water pressure at the filter header must exceed a minimum of 85 psi, to overcome the hydraulic grade line of the distribution system. The dirty bed headloss across the pressure filters will range from eight to ten psi.

FILTERED AND FINISH WATER MAIN

Filtered water exits the filters and combines into a combined 12-inch filtered water header. Filtered water runs across the western face of the building, through a 12-inch check valve, to the chemical application area for final pH adjustment and chlorine residual addition, if required. An 8-inch check valve bypass, activated by a manual butterfly valve, can provide emergency wash water to the filters from the distribution system. The filtered water header includes a future polyfluoroalkyl substances (PFAS) secondary treatment connection via two blind flanges and an isolation butterfly valve, described further below.

FUTURE SECONDARY TREATMENT

The WTP includes design provisions for future secondary treatment within the building footprint. Space is provided for a granular activated carbon (GAC) pressure filtration system and associated appurtenances for the treatment of PFAS. The secondary treatment connection shall include a post-filtration chemical application point for sodium bisulfite, a dechlorination chemical, upstream of the GAC filters. The additional head of the secondary treatment system will require future upgrades the impellers on the Well 3A, and Well 4 pumps to maintain design efficiency.

BACKWASH WASTE PUMPS

Two 10 horsepower vertical turbine pumps (1 duty and 1 standby) with variable frequency drives (VFDs) shall be provided for backwash waste. The pumps are situated above the backwash waste tank (1 above each compartment) and pump backwash waste to the Towns sanitary sewer system via a 4-inch PVC force main. The pumps are designed to slowly drain the backwash waste tanks at night when municipal sewer demand is low.

ADDITIONAL DESIGN CONSIDERATIONS

Additional items to consider for the next phase of design include:

- Obtain approval from MassDEP to reactivate Well 4, pending MPA testing;
- Confirm operating setpoints of proposed WTP;
- Complete flow test and finalize the selection of the well replacement pumps.

DESIGN CRITERIA

Table 4 – Backwash and Recycle Water Pumping

Process	Parameter	Value	Unit
Backwash Waste Pumps	# of Pumps	2	
	Pump Design Point	125 gpm @ 185 feet TDH	
	Size	10	HP
	Drive	Variable	
	Type	Vertical Turbine	

Table 5: Proposed Well Pump Modifications

Process	Parameter	Value	Unit
Well 3A Pump	# of Pumps	1	
	Pump Design Point	850 gpm @ 279 feet TDH	
	Size	100	HP
	Drive	Variable	
	Type	Submersible	
Well 4 Pump	# of Pumps	1	
	Pump Design Point	700 gpm @ 271 feet TDH	
	Size	75	HP
	Drive	Variable	
	Type	Submersible	

ATTACHMENT 2

Civil/Site Technical Memorandum

ENVIRONMENTAL PARTNERS

TECHNICAL MEMORANDUM

Date: May 2020

To Maurice Goulet, Director of Public Works, Town of Medfield

From Eric Kelley, Project Manager, Environmental Partners

CC Paul Millett, Senior Principal, Environmental Partners
Dave Patangia, Principal, Environmental Partners
Tyler Schmidt, Project Engineer, Environment Partners

Subject Wells 3 & 4 Water Treatment Plant
Town of Medfield, Massachusetts
Civil/Site Technical Memorandum

This technical memorandum presents design information and details regarding the proposed civil design and site layout for the Medfield Wells 3 & 4 Water Treatment Plant (WTP). This technical memorandum includes a review and description of the existing conditions as well as the proposed grading, drainage, site access, parking, and utilities for the WTP. A site plan for the proposed project is included in Attachment 11 – Preliminary Design Drawings.

EXISTING CONDITIONS

The site selected for the proposed water treatment plant is a predominantly undeveloped, wooded area northwest of existing Well 3 and southeast of existing Well 4. The Town of Medfield (the Town) currently maintains an access drive off of Elm Street at 43 Elm Street, Medfield, MA (Book 4438, Page 648, Property ID 30-004) that leads to Well houses 3 and 4. The access drive connects to the Ralph Wheelock School parking lot. A locked steel swing gate resides at the limits of the school parking lot, limiting vehicular traffic on the access road to Town approved vehicles only. The site remains open to pedestrians utilizing a tributary of the Bay Circuit Walking Trail. The 18-foot wide asphalt paved drive is approximately 2,730 feet long. A soccer field resides on the north side of the access road, and railroad tracks parallel the access road to the south. After the soccer field, the access road intersects with a perpendicular access drive that runs north to south; and this road connects the driveways of wells 3 and 4. Each well driveway has an 8-inch water main that runs from both wells and connects to a 12-inch finished water main along the north to south access drive. The 12-inch water main runs through the wooded area where it connects with an existing 12-inch ductile iron water main on Elm

Street to the north and High Street to the south. Overhead electric power runs from Elm Street to Well houses 3 and 4 through an easement north of the soccer field.

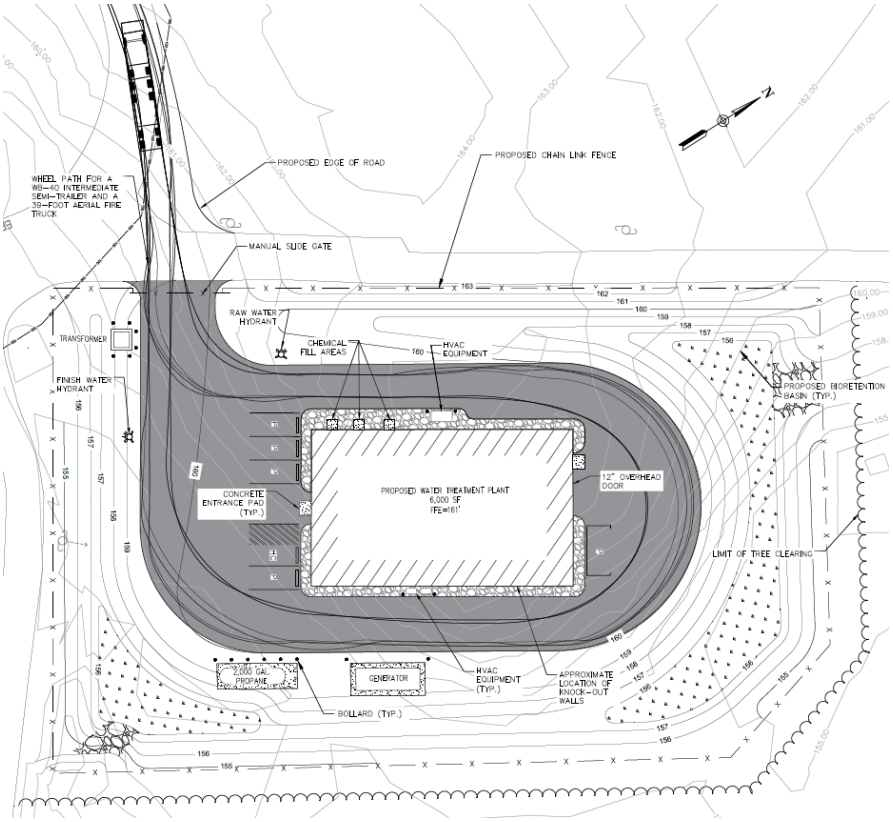
The site of the proposed WTP gradually slopes up from an elevation of 154 feet to a high point of 166 feet at the center of the proposed building. Portions of the site around well 4 are within Zone A of the FEMA floodplain 4. The proposed WTP is outside of the floodplain. Wetlands, as recorded in MassGIS, are located across the road near the railroad tracks. The 100-foot buffer likely includes the roadway and the southwest corner of the site. Wetland delineation is scheduled for later in May.

PROPOSED CONDITIONS

SITE ACCESS

The existing 18-foot access road from Elm Street shall remain and all vehicles shall access the WTP through this existing roadway. The access road limits are adjusted at the intersection with the north to south access drive and proposed WTP driveway to allow for adequate vehicle access into the WTP site. Lighting shall be mounted on the building to illuminate the driveway and nearby access road, as noted in the Electrical Technical Memorandum. The new driveway shall be sufficiently wide to provide access for a standard 39-foot aerial fire truck and a 45.5-foot WB-40 Intermediate Semi-Trailer for chemical deliveries. Chemicals are transferred into storage through individual fill stations on the west side of the building. Parking includes six (6) parking spots, including one ADA accessible parking space. Parking does not limit fire or chemical distribution vehicle access. The vehicle turning analysis is shown in Figure 1 below.

Figure 1: Vehicle Turning Analysis



The driveway is 20 feet wide on the east and west sides of the building. The north side of the driveway is 45 feet wide to accommodate a large vehicle turning radius and provide access to the overhead door. The south side of the driveway is 60 feet wide to accommodate parking and a large vehicle turning radius. A chain-link fence with a lean-in top (total 9.5 feet high) surrounds the WTP and driveway with a manual slide gate at the driveway entrance. No pedestrian gates are proposed.

PARKING AND BUILDING ACCESS

There are six (6) parking spots provided for the WTP. Five (5) located at the southern side of the building near the main entrance door. One (1) is located on the northern side near the overhead door. Parking includes five standard 9-foot wide spaces and one ADA compliant 16-foot wide van-accessible space wide enough for loading/unloading. All spaces are 19 feet long and include a concrete wheel stop.

A 4-foot wide gravel area surrounds the perimeter of the building. A bituminous asphalt berm protects the gravel area where it meets the pavement from vehicular traffic and snow plowing activity. The gravel area houses exterior mechanical equipment from the WTP. On the west side of the building, where the proposed chemical unloading stations and dehumidifier condenser reside, the gravel area expands to 8–feet to provide sufficient equipment separation from the building. Bollards protect large mechanical equipment from passing vehicles.

The north side of the building includes a single secondary door and an overhead door for equipment maintenance access. The northeast side of the building contains three (3) knock-out walls for future water treatment upgrades. The knock-out walls are sized according to specific equipment specifications, as noted in the Process Mechanical Technical Memorandum. Environmental Partners (EP) contacted an equipment rigging company based out of Salisbury MA, Harnum Industries LTD (Harnum). Harnum confirmed the minimum spacing, height, and equipment offset requirements for the future plant upgrade. In this post WTP construction scenario, large process equipment is shipped flat and placed vertically with a truck-mounted crane, on the northeast side of the driveway perpendicular to each respective knock-out wall. A 60,000-pound capacity fork truck drives each piece of equipment directly into the building to its designated location. Harnum recommends the use of steel plates to cover the underground sanitary tight tank as a precautionary measure in case loading exceeds the tanks H-20 rating.

SITE PREPARATION AND GRADING

Site work is confined to approximately 1.2 acres to limit the extent of tree clearing and maintain a vegetative buffer around the access road. The vegetable buffer serves to provide stormwater controls and minimize noise and visual disturbance for pedestrians utilizing the Bay Circuit Walking Trail. The site grading reduces stormwater runoff and includes treatment and infiltration. Grades on paved areas (access roadway, driveway, parking area) shall typically be ± 2%. All paved areas are sloped so that runoff flows directly to the one of the two proposed bioretention basins. Basins are located to the north and south of the WTP, respectively. Slopes on graded landscaped or unpaved areas shall not exceed 3:1 (H:V). Grading and site work is minimal within the 100-foot wetland buffer zone, and no grading or site work takes place within the FEMA floodplain Zone A.

The WTP finished floor elevation is 161 feet. The edge of the pavement elevation around the driveway is approximately 160 feet. The top of the bioretention basins (discussed further below) is approximately 158-feet (south basin) and 159-feet (north basin). A cut and fill analysis determined the final grade elevations. Excavation volumes for the WTP foundation, backwash waste tank, sanitary tight tank, driveway subgrade, and bioretention basins are offset by the finished site grading to balance out cut and fill volumes. The cut and fill analysis shall be further optimized in the final design.

DRAINAGE

Currently, stormwater on the site flows via sheet flow from the access road and high points in the wooded area to the east, offsite towards wetlands, or infiltrates at various depressions in the wooded area.

Once construction is complete, the two bioretention basins shall collect the majority of stormwater runoff from the new impervious areas. The north bioretention basis resides east of the access road to Well house 4. The south bioretention basin lies north of the access road to Well house 3. Both basins shall consist of 12-inches of gravel and 36-inches of planting soil topped with mulch. At grade, the basins shall have a shallow 6-inch depression and planted with native vegetation. The depression retains runoff from impervious areas and encourages local infiltration. Based on the United States Department of Agriculture (USDA) NRCS soil mapping data, the classification of soils in this area is hydrologic soil group (HSG) A, which is characterized by a high infiltration rate. Geotechnical borings

conducted as a part of the geotechnical evaluation (included in Attachment 3 – Geotechnical Investigation and Construction Recommendations) confirmed the presence of sandy soil and groundwater (estimated at 11 feet below grade) suggesting this is a suitable location for infiltration.

The pavement is surrounded by at minimum a 15-foot grass strip that slopes into the bioretention basins. Area beyond the basins shall be sloped 3:1 towards the fence line to meet the existing grade. The proposed stormwater facilities provide recharge, attenuate the peak discharge, and provide TSS removal. Suitable environmental protection measures are to be implemented during construction to minimize the impact on the surrounding areas.

UTILITIES

Currently, an existing 8-inch finished water main from Well 3 intersects a 12-inch distribution main at the location of the proposed WTP. An 8-inch finished water main from Well 4 connects to the same 12-inch distribution main further north along the access road. The 12-inch distribution main connects to the distribution system on Elm Street to the north and High Street to the south.

For the proposed raw water piping arrangement, the existing 8-inch finished water mains shall become raw water mains to direct the source water to the new WTP. A new 8-inch ductile iron pipe shall run north down the access road towards Well 4, for approximately 1,100 linear feet, and connect to the existing 8-inch main from Well 3/3A. The hydrant at the beginning of the Well 3 access road shall be removed and replaced with a new 8-inch DI raw water main to the WTP. The two 8-inch raw water mains will combine in the WTP driveway and become a single 12-inch raw water main that enters at the southwest corner of the WTP building. A 12-inch finish water pipe exits the WTP in the same corner and connects to the existing 12-inch finished water main at the intersection of the driveway and access road. The junction shall be triple gated with 12-inch gate valves. The tie-in locations at both Wells 3 and 4 each include a ductile iron tee and two 8-inch gate valves to manipulate flow to the treatment plant and distribution system during construction. Upon completion of the facility, the existing mains shall be cut and capped to isolate the raw water from the finished water distribution system. A finished water fire hydrant will be located just off the paved way to the south of the WTP. A raw water fire hydrant will be located just off of the paved way to the west of the WTP (not used for firefighting). The final locations of the fire hydrants will require approval from the Medfield Fire Department. Domestic water for sanitary purposes and water for fire service, if required, will enter the WTP at the proposed mechanical room.

Underground electric and communications shall run from the southeast corner of the WTP to each of the well houses. The WTP primary electrical service shall be tapped off of a utility pole at the intersection of the driveway and access road and run underground to a pad-mounted transformer located southwest of the WTP. The service continues to run underground until it enters near the Southeast corner of the building, as discussed further in the Electrical Technical Memorandum. A propane generator and 2,000 gallon, above ground, propane tank are proposed just off the paved way southeast of the water treatment plant. Both the generator and propane tank are accessible to service vehicles. Propane will enter the WTP building at the proposed mechanical room.

The new WTP discharges residual backwash waste through a 4-inch HDPE sewer force main. The force main exits the WTP near the northwest corner. It continues for approximately 3,600 linear feet along

the driveway, access road, and Elm Street, where it discharges into the existing sanitary sewer. The Town plans to self-perform the construction of the force main from Elm Street to the WTP driveway, including the tie-in to the existing sanitary sewer.

An 8,000-gallon tight tank is proposed to the east of the water treatment plant just off the paved way. The tank shall collect all sanitary waste from the facility, including floor drains, restroom waste, and lab sink. An access manhole shall be provided to clean the tight tank. The access manhole will be accessible to service vehicles from the driveway. The tight tank shall be rated for H-20 loading.

ADDITIONAL DESIGN CONSIDERATIONS

Additional items to consider for the next phase of design include:

- Flow test to confirm distribution hydraulics;
- Stormwater management report, including TSS removal calculations, if required by the Conservation Commission;
- Final site grading with refined cut/fill analysis and optimization;
- Complete wetland flagging;
- Coordination with Tree Warden and Fire Department;
- Coordination with Electrical Utility; and,
- Coordination of Zoning & Planning board review and approval.

ATTACHMENT 3

Geotechnical Technical Memorandum

ENVIRONMENTAL PARTNERS

MEMORANDUM

Date: March 25, 2020

To Town of Medfield, Massachusetts

From Environmental Partners Group. Inc.

CC Eric A Kelley, P.E., Environmental Partners

Subject Geotechnical Investigation and Construction Recommendations
Medfield Water Treatment Plant
Town of Medfield, Massachusetts

Site Location and Description

The project site is located on a property owned by the Town of Medfield. The Department of Public Works operates and manages the site where wells #3 and #4 are located. The Town of Medfield is proposing the installation of a new 6000 square foot water treatment facility with approximate dimensions of 100 feet by 60 feet. It is our understanding that the building will house process mechanical equipment including four pressure filters, three chemical feed and storage rooms, an open space for future carbon vessels, and an underground storage tank below the proposed location of the pressure filters. Initial discussions with the structural engineer indicate that the structural slab supporting the pressure filters will be approximately 1foot-thick, and the mat foundation that will support the underground storage tank will be approximately 2 feet-thick. The exterior foundation walls will be 18 inches thick.

Personnel from Environmental Partners collected the ground surface elevations at the test boring locations using a hand-held GPS unit. The surface elevations of the test boring locations varied from approximately 159.53 to approximately 163.99 for borings GB-1through GB-7. A figure depicting the test boring locations is include as Attachment A. Site coordinates of the center of the proposed building are provided below.

Site Coordinates in Latitude and Longitude	
Latitude	Longitude
42°12' 48"N	71°20' 10"W

Regional Geology

The regional geologic map as mapped on the USGS Geological Map shows the distribution of non-lithified earth materials at land surface in east central Massachusetts ranging from a few feet to about 500 feet overlying bedrock cropping out in upland hills and valley areas. The coarse stratified deposits are mainly composed of gravel-sized clasts; cobbles and boulders predominate; minor amount of sand within gravel beds. Gravel layers generally varied from poorly graded gravel with sand and silt to well graded gravel with sand and silt.

Surface Conditions

The proposed 6,000 square foot water treatment facility will comprise of a pre-engineered metal building on a parcel owned by the Town of Medfield. The lot is currently wooded and is accessible through an existing paved drive that leads to one of the existing wells. The terrain is slightly elevated from the access drive with mild slopes toward the driveway. It is anticipated that a fair amount of clearing and cuts will be required for site and subgrade preparation.

SUBSURFACE EXPLORATION PROCEDURES

Test Borings

On January 23 and 24, 2020, Environmental Partners Group (EPG) retained the services of Northern Drilling Services of Northborough, MA to perform (7) standard penetration test (SPT) borings with a Mobile B-53 with mounted truck rig equipment. The borings were drilled using casings to advance the boreholes. Approximate boring locations are indicated on Figure1 in attachment A of this report. During the sampling procedures, standard penetration tests were performed in the borings in conjunction with the split-barrel sampling. The standard penetration value (N) is defined as the number of blows of a 140-pound hammer, falling thirty inches, is required to advance the split spoon sampler one foot into the soil (ASTM D-1585). The sampler is lowered to the bottom of the drill hole and the number of blows is recorded for each of the three successive increments of six inch penetration. The “N” value is obtained by adding the second and third incremental numbers. The results of the standard penetration test indicate the relative density and comparative consistency of the soils, and thereby provide a basis for estimating relative strength and compressibility of the soil profile components.

Test borings GB-1 through GB-7 were advanced to 26 feet below grade using Wash Borings; wash borings consist of simultaneous drilling and jetting action where a casing is driven into the ground initially, a chopping bit attached at the end of a drilling rod is driven by hammer, thereby breaking up the soil in the casing. Jetting action is accomplished by pumping water downward through the drilling bit. Water emerges at the chopping bit and further serves to break up the soil. Returning water transports soil to the ground surface, where samples can be collected for examination and classification. Such samples are disturbed samples as their water content has been increased. Soil samples were obtained at selected intervals in the soil test borings. Disturbed soil samples were obtained in general accordance with ASTM D-1587 (Thin-Walled Tube Sampling of Soils) using a standard split-spoon sampler. A split spoon sampler is a 2-inch O.D. tube that is driven into the soil

to be sampled that can be split open lengthwise for easy removal and visual inspection of the soil obtained.

Soil Classification

Samples obtained during drilling operation were visually and manually classified in the field in accordance with ASTM D2488. Representative portions of the samples were collected in sample jars and some selective samples were sent out to the laboratory for further examination and verification of field classifications such as gradation analysis, moisture/density relationship, Atterberg Limits, and unconfined compressive strength of rock have been performed. Boring logs indicating depth of borings, N values, penetration and recovery depths, water levels, soil description and rock quality designation (RQD), can be found in Attachment B of this report.

Loam

Top soil and loam layers were encountered in all the borings and consisted of approximately 6 inches. The loam layer was described as sandy brown organic layer with some gravel. For planning purposes, stripping of loam and topsoil during excavation and subgrade preparation can be stockpiled and re-used as top soil provided it meets the specifications for topsoil.

Fill

The fill layer encountered during the subsurface program was predominantly described as brown silty sand with gravel to medium sand with silt and trace of gravel. The depth of the fill layer extended from 6 inches below exiting grade to the depth of the borings the pre-determined depth of 26 feet below the surface.

Water Level Measurements

Groundwater was could not be measured during the subsurface exploration program due to the drive and wash methodology used during drilling. The crew chief reported that the depth of ground water was estimated to be 11 feet below ground surface. The reported depth of groundwater within the borehole was measured at the end of the day based on lowering a tape from the existing grade to the top of water elevation in the borehole after allowing the water to stabilize hours after the drilling was completed.

Settlement Analysis

The borings recently advanced at the proposed pre-engineered building site encountered layers of medium dense and coarse soil for the depths of the borings. Based on our estimates of the current site grades, approximately 13 to 15 feet of cut will be needed at the location of the underground storage tank. Settlements under the filled tank are expected to be within the tolerable range for the

proposed structure. Our settlement estimate indicates that settlements less than 1 inch should be anticipated by end of construction activities and post construction settlements should be negligible. We anticipate that following construction, the underground storage tank be filled and tested for liquid tightness by filling and measuring the loss of water in the tank. ACI 350 and the American Water Works Association recommends maintaining the water level in the tank for a period of 3 days before measuring the drop. Horizontal and vertical movement of the tank foundation should be monitored daily during the first filling of the tank.

Seismic Conditions

Seismic design conditions for this project should utilize a Site Class "C" according to 2009 International Building Code. The IBC Site Class determination is based on the top 100 feet of rock and soil profile. Although the borings performed at the site are much shallower than 100 feet, generalized information of the site and the site conditions suggest this Site Class. Generally, soils most susceptible to liquefaction are saturated, loose sandy soils including granular silts. Soils encountered at the site are not considered to be liquefiable given that the underlying soils are dense/stiff in nature combined with the non-presence of groundwater at shallow depths. Based on the USGS maps, there are no active faults in the general vicinity of the proposed project. Therefore, liquefaction potential is not anticipated to be an issue for the proposed site.

Based on the subsurface conditions encountered, and the assigned seismic Site Class, the mapped maximum considered earthquake spectral response acceleration parameter at short period and 1-s period for Fa and Fv, are 1.6 and 2.4 respectively. The recommended design spectral response acceleration at short periods (SDs) and at 1-second period (SD1), are 0.243 g and .097g, respectively. The risk of seismically induced settlement or liquefaction for this site is relatively low. Additional seismic design parameters are summarized in the table below.

Table 3- Seismic Design Parameters

Site Class C	
Risk Category I/II/III	
S_s- Acceleration Parameter	0.228 g
S_1- Acceleration Parameter	0.06 g
F_a-Site Coefficient	1.6
F_v –Site Coefficient	2.4
S_{MS}- Adjusted MCE* Spectral response Acceleration Parameter	0.364 g
S_{M1} - Adjusted MCE*Spectral response Acceleration Parameter	0.145 g
S_{DS} – Design Spectral Acceleration Parameter	0.243 g
S_{D1} – Design Spectral Acceleration Parameter	0.097 g
T_L – Long Period Transition Period**	6

*Maximum Considered Earthquake
**Figure 22-12, ASCE 7-10

Foundation Design Recommendations

It is our understanding that the building will house process mechanical equipment including four pressure filters, three chemical feed and storage rooms, an open space for future carbon vessels, and an underground storage tank below the proposed location of the pressure filters. Initial discussions with the structural engineer indicate that the structural slab supporting the pressure filters will be approximately 1foot-thick, and the mat foundation that will support the underground storage tank will be approximately 2 feet-thick. The exterior foundation walls will be 18 inches thick.

For the conventional building foundation, it is our opinion that the proposed pre-engineered metal building may be supported on conventional shallow foundation. Based on the standard penetration tests conducted at the site during the subsurface exploration and the calculated bearing capacity, the underlying soils are suitable to carry applied bearing pressures of 2 tons per square foot (tsf) for the anticipated footing size without experiencing potential differential settlement in the order of 1/2 inch. The recommended bearing pressure should provide a factor of safety of 3.0 against shear failure.

The foundation of the proposed building should be placed at a sufficient depth for frost protection. Foundations for unheated structures should be placed at a minimum depth of 4.5 feet below the lowest adjacent grade.

The mat foundation is expected to be placed on a granular leveling base to promote even distribution. We recommend that the thickness of this layer be 8 inches and be composed of free draining, well graded, non-cohesive fill. Use of fine sand, masonry sand, or recycled concrete is not allowed.

The on-site soil may be reused as fill material across the site and as backfill against foundations. Some reconditioning and moisture adjustment of the excavated soils may become required to achieve the desired degree of compaction.

It is our recommendation to excavate and remove any loose fill from existing grade and replace with structural fill to the proposed bottom of foundation elevation. The structural fill should be compacted in thin lifts (6 to 8 inches) such that the entire lifts can achieve a minimum compaction of 95% of the maximum dry density as determined by ASTM D1557. Moisture conditioning within +/- 3% of the optimum moisture content of the soils may be required.

Table 4 –Foundation Design Parameters

Parameter	Value
Allowable Bearing Capacity	2 tsf
Friction Angle	32°
Unit Weight	105 pcf

CONSTRUCTION CONSIDERATIONS

The foundation areas should be prepared first by removing asphalt, topsoil, and other unsuitable materials to expose the naturally deposited inorganic sand and gravel. The outer limit of the

excavation should be at least 5 feet beyond the outer perimeter of the footing, where possible, without disturbing the foundations of adjacent structures.

Temporary construction slopes should be designed and excavated in strict compliance with the rules and regulations of the Occupational Safety and Health Administration (OSHA), 29 CFR, Part 1926.

Groundwater will most likely be encountered in the excavation for the underground storage tank. It is anticipated that groundwater and surface water entering the building foundation excavations can be managed to prevent foundation subgrade disturbance using normal diversion trenching and sump pumping.

Foundation bearing soils should not be allowed to freeze before, during, or after foundation construction. In addition, the exposed foundation subgrade should be compacted with a heavy vibratory roller until firm and stable.

All fill placed below foundation bearing levels, as well as over footings, against foundation, and in areas that are designated to be paved, should be structural fill. Structural fill is defined as well graded natural sand and gravel with a maximum particle size of four inches and no more than 10 percent passing the No. 200 sieve. Structural fill should be placed in 6 to 8 inch loose lifts and compacted to 95% if the Modified Proctor Maximum Dry Density (ASTM D1557) for the specific material being used.

It is recommended that structural fills be constructed as controlled, well-compacted engineered fills. Structural engineered fill should be inorganic, low plastic clay, sand, or gravel. It is recommended that only granular fill be used within the building footprint and within 5 feet of the foundation footprint, where possible. The intent of these recommendations is to reduce the potential for consolidation and settlement of new fills.

Laboratory testing should be performed on the fill materials to determine the appropriate moisture-density relationship of the fill being placed. Adjustments to the soil moisture by wetting or drying should be made as needed during fill placement. During grading operations, representative samples of the proposed imported structural fill materials should be periodically checked via laboratory testing. A full-time representative from the testing agency should be on site to monitor excavation and grading operation as well as the suitability of fill materials. All finished and disturbed ground surfaces should be adequately prepared to reduce erosion.

STRUCTURAL FILL PLACEMENT GUIDELINES

Area	Degree of Compaction Based on ASTM D1557
Below Footings & Slabs	95%
Utility Trenches within building and pavement area	95%
Grade-raise fill placed within 1 foot of the base of the pavement	95%
Granular cushion beneath Floor Slab and over Footings	95%
Structural Fill supporting footing	95%
Other Landscape Areas	92%

Crushed Stone: Crushed stone shall consist of durable crushed rock or durable crushed gravel stone, free from ice and snow, sand, clay, loam, or other deleterious or organic material. The crushed stone shall be uniformly blended and shall conform to the following requirements.

Percent Passing by Weight		
Sieve Size	¾" Stone*	½" Stone
1-inch	75-100	-------
¾- inch	0-5	------
5/8-inch	------	100
½- inch	------	85-100
3/8-inch	------	15-45
No.4	------	0-15
No.8	------	0-15

*Stone shall be washed

Attachments

Attachment A – Figures

Attachment B – Boring Logs

Limitations

This report has been prepared in accordance with generally accepted geotechnical engineering practices and it is intended to be used to assist in the design of the new water treatment plant. The findings and recommendations contained in this report are based on site conditions encountered during the subsurface exploration in January 2020. These opinions were arrived at in accordance with accepted engineering procedures at this time. Conclusions and additions made from these data by others are their responsibilities. Should the location of the proposed building change, or if the soil conditions become notably different during construction from those described herein, Environmental Partners should be notified immediately. Should potentially hazardous materials be encountered at the site during excavation, an environmental investigation should be performed immediately.

Prepared by: _____

Ziad F. Kary, P.E.
Senior Project Manager
Environmental Partners Group, Inc.

REFERENCES

- *American Society for Testing and Materials, 2004, Standard test method for penetration test and Split-barrel sampling of soils, Test Method D1586-99, in Annual Book of ASTM Standards.*

- *Geologic Provinces of New England, U.S. Geological Survey, pubs.usgs.gov/of/2003/of03-225/fig1.html.*

- *USGS Massachusetts Seismic Hazard Map. USGS earthquake.usgs.gov/states/Massachusetts/hazards.php*

- *2006/2009 International Building code*

Attachment A

Install new SMH and connect sewer force main to gravity sewer

Private Trust
75 Elm Street
(34-012)

45 Elm Street
(30-001)

Town to install 4" sewer force main

Ralph Wheelock School
17 Elm Street
(33-092)

Disconnect following WTP completion

Well #4

Water Department
Elm Street
(30-004)

8" DI

Railroad

See Detail

0 High Street
(23-040)

Existing Well #3

8" DI

Proposed Well #3a

Well #5

Legend

- Well
- Proposed 4" Sewer Force Main
- Proposed WTP Raw Water
- Proposed WTP Finish Water
- Existing Sewer Main
- Existing Water Main
- Proposed Building
- Parcel Boundary

0 200 400 800 Feet

Connect Proposed 12" DI Finished Water to12"DI Existing Water Main (location dependent on condition assessment of existing main)

GB-7

GB-6

GB-1

GB-5

GB-2

GB-4

GB-3

Propane Tanks

Generator

12" DI

12" DI

Disconnect following WTP completion

Existing Well #3

Proposed Well #3a

Legend

- Well
- Proposed 4" Sewer Force Main
- Proposed WTP Raw Water
- Proposed WTP Finish Water
- Existing Water Main
- Boring Locations
- Proposed Building
- Proposed Road
- Perimeter Fencing

0 50 100 200 Feet

ENVIRONMENTAL PARTNERS

Medfield Water Treatment Plant
Preliminary Design Schematic
February 2020

N W E S

TOWN OF MEDFIELD 1651

Attachment B

BORING LOG

Project: Well 3 & 4 WTP Site Investigation
Location: Medfield, MA
Client: Town of Medfield
Driller: Northern Drilling
Drilling Methods: Drive & Wash
Weather: Sunny, 30°
Performed By: SJG Date: 1/23/2020
Checked By: ZFK

Boring Locus Map

Boring: **GB-1**
Location: See Plan
Approx. Ground Elev: 163.3 ft
Approx. Groundwater Elev: 149.8 ft
Datum: NAVD
Project No. 134-1901

Depth (feet)	Sample No.	Blows per 6-inch	Pen./ Rec. (inches)	Soil Description	Stratum Depth Change (feet)	Note No.
1 2	S1	2 1 7 9	24/18	Topsoil Brown, medium to fine SAND with gravel, dry	TOPSOIL	
3 4						
5 6	S2	9 12 14 14	24/11	Brown, medium to fine SAND with gravel, moist		
7 8 9						
10 11	S3	5 6 7 11	24/13	Brown, fine silty SAND, wet	SAND	
12 13 14						1
15 16	S4	5 4 5 7	24/11	Brown, fine silty SAND, wet		
17 18 19						
20 21	S5	5 6 6 5	24/10	Brown, fine SAND, wet		

NOTES:

1 Driller reported groundwater at approximately 13.5' below grade after allowing boring to settle for 15 minutes.

LEGEND

S - Split Spoon Sample	O/A - Sample Collected Off the Augers
UT - Undisturbed Tube Sample	C - Rock Core
Trace - Approximately 0 to 10%	Some - Approximately 20 to 35%
Little - Approximately 10 to 20%	And - Approximately 35 to 50%
0-4 Coarse Soil N Value - Very Loose	11-30 Coarse Soil N Value - Medium Dense
5-10 Coarse Soil N Value - Loose	31-50 Coarse Soil N Value - Dense
0-2 Fine Soil N Value - Very Soft	4-8 Fine Soil N Value - Medium Stiff
2-4 Fine Soil N Value - Soft	8-15 Fine Soil N Value - Stiff

BORING LOG

Project: Well 3 & 4 WTP Site Investigation
Location: Medfield, MA
Client: Town of Medfield
Driller: Northern Drilling
Drilling Methods: Drive & Wash
Weather: Sunny, 30°
Performed By: SJG Date: 1/23/2020
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Boring Locus Map

Boring: **GB-1**
Location: See Plan
Approx. Ground Elev: 163.3 ft
Approx. Groundwater Elev: 149.8 ft
Datum: NAVD
Project No. 134-1901

Depth (feet)	*Sample No.*	*Blows per 6-inch*	*Pen./ Rec. (inches)*	*Soil Description*	*Stratum Depth Change (feet)*	*Note No.*
22					SAND	
23						
24						
25	S6	2 3 3 3	24/9	Brown, fine SAND, wet		
26						
				Boring terminated at predetermined depth of 26' below grade		2

NOTES:

2 Boring terminated at 26' below grade.

LEGEND

S - Split Spoon Sample	O/A - Sample Collected Off the Augers
UT - Undisturbed Tube Sample	
Trace - Approximately 0 to 10%	Some - Approximately 20 to 35%
Little - Approximately 10 to 20%	And - Approximately 35 to 50%
0-4 Coarse Soil N Value - Very Loose	11-30 Coarse Soil N Value - Medium Dense
5-10 Coarse Soil N Value - Loose	31-50 Coarse Soil N Value - Dense
0-2 Fine Soil N Value - Very Soft	4-8 Fine Soil N Value - Medium Stiff
2-4 Fine Soil N Value - Soft	8-15 Fine Soil N Value - Stiff

BORING LOG

Project: Well 3 & 4 WTP Site Investigation
Location: Medfield, MA
Client: Town of Medfield
Driller: Northern Drilling
Drilling Methods: Drive & Wash
Weather: Sunny, 30°
Performed By: SJG Date: 1/23/2020
Checked By: ZFK

Boring Locus Map

Boring: **GB-2**
Location: See Plan
Approx. Ground Elev: 162.82 ft
Approx. Groundwater Elev: 149.32 ft
Datum: NAVD
Project No. 134-1901

Depth (feet)	Sample No.	Blows per 6-inch	Pen./ Rec. (inches)	Soil Description	Stratum Depth Change (feet)	Note No.
1 2	S1	2 5 7 9	24/6	Topsoil	TOPSOIL	
3 4						
5 6	S2	9 12 14 14	24/11	Brown, fine SAND with trace gravel, dry	SAND	
7 8 9						
10 11	S3	5 8 11 16	24/13	Brown, SILT, dry	SILT	
12 13 14						1
15 16	S4	6 6 6 5	24/11	Brown, fine silty SAND, wet		
17 18 19					SAND	
20 21	S5	3 3 4 5	24/11	Brown, fine SAND, wet		

NOTES:

1 Groundwater is believed to be between 11' and 14' below grade.

LEGEND

S - Split Spoon Sample	O/A - Sample Collected Off the Augers
UT - Undisturbed Tube Sample	C - Rock Core
Trace - Approximately 0 to 10%	Some - Approximately 20 to 35%
Little - Approximately 10 to 20%	And - Approximately 35 to 50%
0-4 Coarse Soil N Value - Very Loose	11-30 Coarse Soil N Value - Medium Dense
5-10 Coarse Soil N Value - Loose	31-50 Coarse Soil N Value - Dense
0-2 Fine Soil N Value - Very Soft	4-8 Fine Soil N Value - Medium Stiff
2-4 Fine Soil N Value - Soft	8-15 Fine Soil N Value - Stiff

BORING LOG

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Weather: Sunny, 30°
Performed By: SJG Date: 1/23/2020
Checked By: ZFK

Boring Locus Map

Boring: **GB-2**
Location: See Plan
Approx. Ground Elev: 162.82 ft
Approx. Groundwater Elev: 149.32 ft
Datum: NAVD
Project No. 134-1901

Depth (feet)	*Sample No.*	*Blows per 6-inch*	*Pen./ Rec. (inches)*	*Soil Description*	*Stratum Depth Change (feet)*	*Note No.*
22					SAND	
23						
24						
25	S6	4 4 5 6	24/13	Brown, fine SAND, wet		
26						
				Boring terminated at predetermined depth of 26' below grade		2

NOTES:

2 Boring terminated at 26' below grade.

LEGEND

S - Split Spoon Sample	O/A - Sample Collected Off the Augers
UT - Undisturbed Tube Sample	
Trace - Approximately 0 to 10%	Some - Approximately 20 to 35%
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0-4 Coarse Soil N Value - Very Loose	11-30 Coarse Soil N Value - Medium Dense
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Weather: Sunny, 30°
Performed By: SJG Date: 1/23/2020
Checked By: ZFK

Boring Locus Map

Boring: **GB-3**
Location: See Plan
Approx. Ground Elev: 159.53 ft
Approx. Groundwater Elev: 146.03 ft
Datum: NAVD
Project No. 134-1901

Depth (feet)	Sample No.	Blows per 6-inch	Pen./ Rec. (inches)	Soil Description	Stratum Depth Change (feet)	Note No.
1 2	S1	3 3 2 3	24/5	Topsoil Brown, medium to fine SAND with gravel, dry	TOPSOIL	
3 4						
5 6	S2	4 4 4 4	24/10	Brown, medium to fine SAND with trace gravel, moist		
7 8 9						
10 11	S3	9 9 11 15	24/13	Brown, fine silty SAND, moist	SAND	
12 13 14						1
15 16	S4	5 5 6 8	24/7	Brown, fine SAND, wet		
17 18 19						
20 21	S5	5 8 11 10	24/15	Brown, fine SAND, wet		

NOTES:

1 Groundwater is believed to be between 11' and 14' below grade.

LEGEND

S - Split Spoon Sample	O/A - Sample Collected Off the Augers
UT - Undisturbed Tube Sample	C - Rock Core
Trace - Approximately 0 to 10%	Some - Approximately 20 to 35%
Little - Approximately 10 to 20%	And - Approximately 35 to 50%
0-4 Coarse Soil N Value - Very Loose	11-30 Coarse Soil N Value - Medium Dense
5-10 Coarse Soil N Value - Loose	31-50 Coarse Soil N Value - Dense
0-2 Fine Soil N Value - Very Soft	4-8 Fine Soil N Value - Medium Stiff
2-4 Fine Soil N Value - Soft	8-15 Fine Soil N Value - Stiff

BORING LOG

Project: Well 3 & 4 WTP Site Investigation
Location: Medfield, MA
Client: Town of Medfield
Driller: Northern Drilling
Drilling Methods: Drive & Wash
Weather: Sunny, 30°
Performed By: SJG Date: 1/23/2020
Checked By: ZFK

Boring Locus Map

Boring: **GB-3**
Location: See Plan
Approx. Ground Elev: 159.53 ft
Approx. Groundwater Elev: 146.03 ft
Datum: NAVD
Project No. 134-1901

Depth (feet)	*Sample No.*	*Blows per 6-inch*	*Pen./ Rec. (inches)*	*Soil Description*	*Stratum Depth Change (feet)*	*Note No.*
22					SAND	
23						
24						
25	S6	6 6 9 8	24/15	Brown, fine SAND, wet		
26						
				Boring terminated at predetermined depth of 26' below grade		2

NOTES:

2 Boring terminated at 26' below grade.

LEGEND

S - Split Spoon Sample	O/A - Sample Collected Off the Augers
UT - Undisturbed Tube Sample	
Trace - Approximately 0 to 10%	Some - Approximately 20 to 35%
Little - Approximately 10 to 20%	And - Approximately 35 to 50%
0-4 Coarse Soil N Value - Very Loose	11-30 Coarse Soil N Value - Medium Dense
5-10 Coarse Soil N Value - Loose	31-50 Coarse Soil N Value - Dense
0-2 Fine Soil N Value - Very Soft	4-8 Fine Soil N Value - Medium Stiff
2-4 Fine Soil N Value - Soft	8-15 Fine Soil N Value - Stiff

BORING LOG

Project: Well 3 & 4 WTP Site Investigation
Location: Medfield, MA
Client: Town of Medfield
Driller: Northern Drilling
Drilling Methods: Drive & Wash
Weather: Sunny, 30°
Performed By: SJG Date: 1/23/2020
Checked By: ZFK

Boring Locus Map

Boring: **GB-4**
Location: See Plan
Approx. Ground Elev: 162.01 ft
Approx. Groundwater Elev: 148.51 ft
Datum: NAVD
Project No. 134-1901

Depth (feet)	Sample No.	Blows per 6-inch	Pen./ Rec. (inches)	Soil Description	Stratum Depth Change (feet)	Note No.
1	S1	1 3 5 4	24/10	Topsoil Brown, medium to fine SAND with gravel, dry	TOPSOIL	
2						
3					SAND	
4						
5	S2	9 12 12 13	24/12	Brown, medium to fine SAND with trace silt, dry		
6						
7						
8						
9						
10	S3	7 11 11 12	24/13	Brown, SILT, dry	SILT	
11						
12						
13						1
14						
15	S4	8 9 12 14	24/12	Brown, fine SAND, wet		
16						
17					SAND	
18						
19						
20	S5	7 6 11 12	24/13	Brown, fine SAND, wet		
21						

NOTES:

1 Groundwater is believed to be between 11' and 14' below grade.

LEGEND

S - Split Spoon Sample	O/A - Sample Collected Off the Augers
UT - Undisturbed Tube Sample	C - Rock Core
Trace - Approximately 0 to 10%	Some - Approximately 20 to 35%
Little - Approximately 10 to 20%	And - Approximately 35 to 50%
0-4 Coarse Soil N Value - Very Loose	11-30 Coarse Soil N Value - Medium Dense
5-10 Coarse Soil N Value - Loose	31-50 Coarse Soil N Value - Dense
0-2 Fine Soil N Value - Very Soft	4-8 Fine Soil N Value - Medium Stiff
2-4 Fine Soil N Value - Soft	8-15 Fine Soil N Value - Stiff

BORING LOG

Project: Well 3 & 4 WTP Site Investigation
Location: Medfield, MA
Client: Town of Medfield
Driller: Northern Drilling
Drilling Methods: Drive & Wash
Weather: Sunny, 30°
Performed By: SJG Date: 1/23/2020
Checked By: ZFK

Boring Locus Map

Boring: **GB-4**
Location: See Plan
Approx. Ground Elev: 162.01 ft
Approx. Groundwater Elev: 148.51 ft
Datum: NAVD
Project No. 134-1901

Depth (feet)	*Sample No.*	*Blows per 6-inch*	*Pen./ Rec. (inches)*	*Soil Description*	*Stratum Depth Change (feet)*	*Note No.*
22 23 24					SAND	
25 26	S6	9 12 11 14	24/19	Brown, fine SAND with 1" bands of silt thoughout, wet		
Boring terminated at predetermined depth of 26' below grade						2

NOTES:

2 Boring terminated at 26' below grade.

LEGEND

S - Split Spoon Sample	O/A - Sample Collected Off the Augers
UT - Undisturbed Tube Sample	
Trace - Approximately 0 to 10%	Some - Approximately 20 to 35%
Little - Approximately 10 to 20%	And - Approximately 35 to 50%
0-4 Coarse Soil N Value - Very Loose	11-30 Coarse Soil N Value - Medium Dense
5-10 Coarse Soil N Value - Loose	31-50 Coarse Soil N Value - Dense
0-2 Fine Soil N Value - Very Soft	4-8 Fine Soil N Value - Medium Stiff
2-4 Fine Soil N Value - Soft	8-15 Fine Soil N Value - Stiff

BORING LOG

Project: Well 3 & 4 WTP Site Investigation
Location: Medfield, MA
Client: Town of Medfield
Driller: Northern Drilling
Drilling Methods: Drive & Wash
Weather: Sunny, 40°
Performed By: SJG Date: 1/24/2020
Checked By: ZFK

Boring Locus Map

Boring: **GB-5**
Location: See Plan
Approx. Ground Elev: 162.58 ft
Approx. Groundwater Elev: 149.08 ft
Datum: NAVD
Project No. 134-1901

Depth (feet)	Sample No.	Blows per 6-inch	Pen./ Rec. (inches)	Soil Description	Stratum Depth Change (feet)	Note No.
1 2	S1	2 4 8 14	24/12	Topsoil Loam Grey, medium to coarse SAND with gravel, dry	TOPSOIL LOAM	
3 4						
5 6	S2	9 10 11 11	24/12	Brown, poorly graded SAND, dry		
7 8 9					SAND	
10 11	S3	4 8 12 12	24/13	Brown, silty SAND, dry		
12 13 14						1
15 16	S4	4 3 5 6	24/14	Brown, SILT, wet	SILT	
17 18 19						
20 21	S5	3 2 1 1	24/23	Brown, silty SAND, wet	SAND	

NOTES:

1 Groundwater is believed to be between 11' and 14' below grade.

LEGEND

S - Split Spoon Sample	O/A - Sample Collected Off the Augers
UT - Undisturbed Tube Sample	C - Rock Core
Trace - Approximately 0 to 10%	Some - Approximately 20 to 35%
Little - Approximately 10 to 20%	And - Approximately 35 to 50%
0-4 Coarse Soil N Value - Very Loose	11-30 Coarse Soil N Value - Medium Dense
5-10 Coarse Soil N Value - Loose	31-50 Coarse Soil N Value - Dense
0-2 Fine Soil N Value - Very Soft	4-8 Fine Soil N Value - Medium Stiff
2-4 Fine Soil N Value - Soft	8-15 Fine Soil N Value - Stiff

BORING LOG

Project: Well 3 & 4 WTP Site Investigation
Location: Medfield, MA
Client: Town of Medfield
Driller: Northern Drilling
Drilling Methods: Drive & Wash
Weather: Sunny, 40°
Performed By: SJG Date: 1/24/2020
Checked By: ZFK

Boring Locus Map

Boring: **GB-5**
Location: See Plan
Approx. Ground Elev: 162.58 ft
Approx. Groundwater Elev: 149.08 ft
Datum: NAVD
Project No. 134-1901

Depth (feet)	Sample No.	Blows per 6-inch	Pen./ Rec. (inches)	Soil Description	Stratum Depth Change (feet)	Note No.
22						
23						
24					SAND	
25	S6	4 4 8 11	24/17	Brown, silty SAND, wet		
26						
Boring terminated at predetermined depth of 26' below grade						2

NOTES:

2 Boring terminated at 26' below grade.

LEGEND

S - Split Spoon Sample	O/A - Sample Collected Off the Augers
UT - Undisturbed Tube Sample	
Trace - Approximately 0 to 10%	Some - Approximately 20 to 35%
Little - Approximately 10 to 20%	And - Approximately 35 to 50%
0-4 Coarse Soil N Value - Very Loose	11-30 Coarse Soil N Value - Medium Dense
5-10 Coarse Soil N Value - Loose	31-50 Coarse Soil N Value - Dense
0-2 Fine Soil N Value - Very Soft	4-8 Fine Soil N Value - Medium Stiff
2-4 Fine Soil N Value - Soft	8-15 Fine Soil N Value - Stiff

BORING LOG

Project: Well 3 & 4 WTP Site Investigation
Location: Medfield, MA
Client: Town of Medfield
Driller: Northern Drilling
Drilling Methods: Drive & Wash
Weather: Sunny, 40°
Performed By: SJG Date: 1/24/2020
Checked By: ZFK

Boring Locus Map

Boring: **GB-6**
Location: See Plan
Approx. Ground Elev: 163.99 ft
Approx. Groundwater Elev: 150.49 ft
Datum: NAVD
Project No. 134-1901

Depth (feet)	Sample No.	Blows per 6-inch	Pen./ Rec. (inches)	Soil Description	Stratum Depth Change (feet)	Note No.
1 2	S1	2 5 8 12	24/18	Topsoil Brown, medium to coarse SAND with gravel, dry	TOPSOIL	
3 4						
5 6	S2	9 10 13 13	24/10	Brown, poorly graded SAND, dry		
7 8 9						
10 11	S3	6 6 9 13	24/11	Brown, silty SAND, dry		
12 13 14					SAND	1
15 16	S4	7 8 9 9	24/12	Brown, silty SAND, wet		
17 18 19						
20 21	S5	4 4 4 5	24/10	Brown, fine SAND, wet		

NOTES:

1 Groundwater is believed to be between 11' and 14' below grade.

LEGEND

S - Split Spoon Sample	O/A - Sample Collected Off the Augers
UT - Undisturbed Tube Sample	C - Rock Core
Trace - Approximately 0 to 10%	Some - Approximately 20 to 35%
Little - Approximately 10 to 20%	And - Approximately 35 to 50%
0-4 Coarse Soil N Value - Very Loose	11-30 Coarse Soil N Value - Medium Dense
5-10 Coarse Soil N Value - Loose	31-50 Coarse Soil N Value - Dense
0-2 Fine Soil N Value - Very Soft	4-8 Fine Soil N Value - Medium Stiff
2-4 Fine Soil N Value - Soft	8-15 Fine Soil N Value - Stiff

BORING LOG

Project: Well 3 & 4 WTP Site Investigation
Location: Medfield, MA
Client: Town of Medfield
Driller: Northern Drilling
Drilling Methods: Drive & Wash
Weather: Sunny, 40°
Performed By: SJG Date: 1/24/2020
Checked By: ZFK

Boring Locus Map

Boring: **GB-6**
Location: See Plan
Approx. Ground Elev: 163.99 ft
Approx. Groundwater Elev: 150.49 ft
Datum: NAVD
Project No. 134-1901

Depth (feet)	Sample No.	Blows per 6-inch	Pen./ Rec. (inches)	Soil Description	Stratum Depth Change (feet)	Note No.
22						
23						
24					SAND	
25	S6	5 2 3 3	24/16	Brown, fine SAND, wet		
26						
				Boring terminated at predetermined depth of 26' below grade		2

NOTES:

2 Boring terminated at 26' below grade.

LEGEND

S - Split Spoon Sample	O/A - Sample Collected Off the Augers
UT - Undisturbed Tube Sample	
Trace - Approximately 0 to 10%	Some - Approximately 20 to 35%
Little - Approximately 10 to 20%	And - Approximately 35 to 50%
0-4 Coarse Soil N Value - Very Loose	11-30 Coarse Soil N Value - Medium Dense
5-10 Coarse Soil N Value - Loose	31-50 Coarse Soil N Value - Dense
0-2 Fine Soil N Value - Very Soft	4-8 Fine Soil N Value - Medium Stiff
2-4 Fine Soil N Value - Soft	8-15 Fine Soil N Value - Stiff

BORING LOG

Project: Well 3 & 4 WTP Site Investigation
Location: Medfield, MA
Client: Town of Medfield
Driller: Northern Drilling
Drilling Methods: Drive & Wash
Weather: Sunny, 40°
Performed By: SJG Date: 1/24/2020
Checked By: ZFK

Boring Locus Map

Boring: **GB-7**
Location: See Plan
Approx. Ground Elev: 163.76 ft
Approx. Groundwater Elev: 150.26 ft
Datum: NAVD
Project No. 134-1901

Depth (feet)	Sample No.	Blows per 6-inch	Pen./ Rec. (inches)	Soil Description	Stratum Depth Change (feet)	Note No.
1 2	S1	3 4 6 9	24/16	Topsoil Brown, medium to fine SAND with gravel, dry	TOPSOIL	
3 4						
5 6	S2	10 10 10 9	24/10	Brown, medium to fine SAND with trace gravel, dry		
7 8 9						
10 11	S3	5 5 7 12	24/12	Brown, silty SAND, dry	SAND	
12 13 14						1
15 16	S4	5 7 7 7	24/14	Brown, silty SAND, wet		
17 18 19						
20 21	S5	1 2 1 1	24/17	Brown, fine SAND, wet		

NOTES:

1 Groundwater is believed to be between 11' and 14' below grade.

LEGEND

S - Split Spoon Sample	O/A - Sample Collected Off the Augers
UT - Undisturbed Tube Sample	C - Rock Core
Trace - Approximately 0 to 10%	Some - Approximately 20 to 35%
Little - Approximately 10 to 20%	And - Approximately 35 to 50%
0-4 Coarse Soil N Value - Very Loose	11-30 Coarse Soil N Value - Medium Dense
5-10 Coarse Soil N Value - Loose	31-50 Coarse Soil N Value - Dense
0-2 Fine Soil N Value - Very Soft	4-8 Fine Soil N Value - Medium Stiff
2-4 Fine Soil N Value - Soft	8-15 Fine Soil N Value - Stiff

BORING LOG

Project: Well 3 & 4 WTP Site Investigation
Location: Medfield, MA
Client: Town of Medfield
Driller: Northern Drilling
Drilling Methods: Drive & Wash
Weather: Sunny, 40°
Performed By: SJG Date: 1/24/2020
Checked By: ZFK

Boring Locus Map

Boring: **GB-7**
Location: See Plan
Approx. Ground Elev: 163.76 ft
Approx. Groundwater Elev: 150.26 ft
Datum: NAVD
Project No. 134-1901

Depth (feet)	*Sample No.*	*Blows per 6-inch*	*Pen./ Rec. (inches)*	*Soil Description*	*Stratum Depth Change (feet)*	*Note No.*
22 23 24					SAND	
25 26	S6	7 10 20 7	24/14	Brown, medium to fine SAND, wet Brow, SILT, wet	SILT	
Boring terminated at predetermined depth of 26' below grade						2

NOTES:

2 Boring terminated at 26' below grade.

LEGEND

S - Split Spoon Sample	O/A - Sample Collected Off the Augers
UT - Undisturbed Tube Sample	
Trace - Approximately 0 to 10%	Some - Approximately 20 to 35%
Little - Approximately 10 to 20%	And - Approximately 35 to 50%
0-4 Coarse Soil N Value - Very Loose	11-30 Coarse Soil N Value - Medium Dense
5-10 Coarse Soil N Value - Loose	31-50 Coarse Soil N Value - Dense
0-2 Fine Soil N Value - Very Soft	4-8 Fine Soil N Value - Medium Stiff
2-4 Fine Soil N Value - Soft	8-15 Fine Soil N Value - Stiff

ATTACHMENT 4

Process Mechanical Technical Memorandum

ENVIRONMENTAL PARTNERS

TECHNICAL MEMORANDUM

Date: May 2020

To Maurice Goulet, Director of Public Works, Town of Medfield

From Eric Kelley, Project Manager, Environmental Partners

CC Paul Millett, Senior Principal, Environmental Partners
Dave Patangia, Principal, Environmental Partners
Tyler Schmidt, Project Engineer, Environment Partners

Subject Wells 3 & 4 Water Treatment Plant
Town of Medfield, Massachusetts
Process Mechanical Technical Memorandum

This technical memorandum presents design information and details regarding the proposed process mechanical systems for the Wells 3 & 4 Water Treatment Plant (WTP). This technical memorandum includes a review and description of proposed facilities and design considerations related to chemical feed and storage, pressure filtration, and backwash systems for the WTP. The proposed layouts of these systems within the WTP are provided in Attachment 11 – Preliminary Design Drawings. Attachment 1 includes a description of the hydraulics for the WTP.

EXISTING CONDITIONS

The Town of Medfield (Town) does not currently have a water treatment facility for any of its sources. Chemical treatment is applied at each respective well house before discharge into the distribution system. The Town is currently experiencing declining source water quality across its wells. It relies heavily on Well 6, which is within the Charles River Basin, for approximately 50% of its annual water supply based upon 2014-2019 withdrawals. Well 4 has been offline since the late 1990s due to poor water quality, including elevated concentrations of manganese. Well 3 provides up to 20% of the Town's water supply and was rehabilitated most recently in 2015, but is operated at reduced capacity due to hydraulic limitations of the well's narrow screen. These water supply challenges limit the Town's flexibility in managing their water supplies and present risks to meeting peak demands in the event Well 6 or Well 3 is taken out of service.

In January 2019, Environmental Partners conducted a pilot treatability study on groundwater from well 3 to evaluate the removal of source water manganese from future replacement Well 3A. The Massachusetts Department of Environmental Protection (MassDEP) approved the pilot study in April 2019 with an approved filter loading rate of 9 gpm/sf. Well 4 was excluded from the pilot study due to pending microscopic particulate analysis (MPA) testing. MPA results, expected in summer 2020, will determine the applicability of reactivating well 4. The chemical feed and pressure filter systems described herein are sized based on the findings of the treatability study and the permitted capacity of the wells.

PROCESS SYSTEMS

CHEMICAL FEED AND STORAGE

Raw water from Wells 3A and 4 shall be blended before entering the WTP and then chemically treated with potassium hydroxide (50%) for pH adjustment and sodium hypochlorite (12.5%) for the oxidation of metals, disinfection of pathogens, and continuous regeneration of the filter media. The required pre-oxidation contact time provided by the 12-inch main to the pressure filters exceeds both the 5 second contact time in the pilot and the 15-second contact time recommended by filter media manufacturers. Following filtration, potassium hydroxide and sodium hypochlorite shall be added, as required, for optimal pH and disinfection residual in the distribution system. The design of the proposed chemical feed and storage areas for the WTP is in conformance with the Massachusetts Department of Environmental Protection's (MassDEP's) Guidelines for Public Water Systems, Chapter 6 – Chemical Applications.

Based on the treatability study, a dose of 25 mg/L (dry dose) potassium hydroxide pre-filtration provides optimal pH conditions for oxidation and maintains the finished water pH around 7.2. If necessary, the filter effluent may be dosed up to 10 mg/L (dry dose) potassium hydroxide to achieve the desired finished water pH. Similarly, a dose of 2.0 mg/L (dry dose) sodium hypochlorite pre-filtration provides adequate oxidation of dissolved iron and manganese while also providing a filter effluent chlorine residual of approximately 1 mg/L under normal operations. If necessary, the filter effluent may be dosed up to 1 mg/L (dry dose) sodium hypochlorite to achieve the Town's current finished water chlorine residual target of 0.5 mg/L to provide 4-log removal. Flow rates exceeding 1.8 MGD require a higher chlorine residual to provide 4-log removal. The chemical feed controls shall be programmed to increase the residual target to 0.8 mg/l as a function of flow to maintain 4-log compliance. The dose of sodium hypochlorite may fluctuate depending on the concentrations of iron and manganese in the raw water. Generally, the dose follows the stoichiometric rule of thumb: 3 times the raw water manganese concentration, plus the raw water iron concentration, plus the desired residual. In-line analyzers monitor pH and chlorine residual at the filter influent and effluent. The chemical feed and storage systems are sized based on the average day dosing requirements noted above, and the average proposed water treatment plant operational capacity of 1.5 million gallons per day (MGD).

The WTP includes space for the addition of a future dechlorinating chemical. Provisions include a chemical feed containment room and area for a sodium bisulfite (30%) chemical feed system to

dechlorinate filtered water. Proposed drinking water regulations regarding polyfluoroalkyl substances (PFAS) may require a future carbon adsorption removal system. Post filtration chlorine residual shall be removed with a dose of 0.95 mg/l (dry dose) sodium bisulfite before secondary treatment with carbon. Prior to entering the distribution system, the post-carbon water shall be rechlorinated with sodium hypochlorite to meet the desired water system residual, as described above.

Bulk Chemical Storage

In accordance with Chapter 6 – Chemical Application of the Guidelines for Public Water Systems, the bulk storage tanks for sodium hypochlorite, potassium hydroxide, and sodium bisulfite (future) are sized for a minimum of 30 days of chemical supply to meet average treated water demand. The bulk storage tanks will be specified with integrally molded flanged outlets (IMFO), providing an outlet at the base to allow for complete draining and flushing. IMFO minimizes the potential for perchlorate contamination in the sodium hypochlorite tank. The potassium hydroxide (50%) bulk tank capacity is nominally 1,400 gallons. The sodium hypochlorite (12.5%) bulk tank capacity is nominally 545 gallons. The future sodium bisulfate (30%) bulk tank is nominally 115 gallons. The west face of the building includes dedicated chemical fill stations for bulk chemical deliveries.

Day Tanks

Day tanks for the addition of potassium hydroxide (50%), sodium hypochlorite (12.5%), and sodium bisulfite (30%) contain 30 to 60 hours of chemical supply to meet average treated water demand. Pre- and post-filtration chemical application systems utilize separate day tanks. The day tanks for potassium hydroxide are 325 gallons and 120 gallons for pre- and post-filtration, respectively. The day tanks for sodium hypochlorite (12.5%) are 55 gallons and 30 gallons for pre- and post-chlorination, respectively. The dank tank for sodium bisulfite (30%) is 10 gallons for post-filtration only.

Transfer pumps fill the day tanks from the respective bulk storage tanks. The pumps are floor mounted with permanent piping to the respective bulk and day tank and equipped with a spring-loaded or magnetic switch to prevent overfilling. Each day tank takes between 30 seconds to 3 minutes to fill.

Chemical Metering Pumps

The chemical metering pumps shall meet the maximum flow rate and head conditions. All chemical feed systems in the facility include standby units of equivalent capacity for redundancy. The metering pumps have a turndown ratio of 100 to 1. Metering pumps shall be installed on an elevated shelf near each respective application point.

Secondary Containment

Separate containment shall provide for 110% of the liquid volume stored for sodium hypochlorite, potassium hydroxide, and sodium bisulfite areas. Per code requirements, the secondary containment areas shall also contain 20 minutes of fire sprinkler volume in the event of a fire.

Chemical containment areas are proposed in a recessed slab approximately three (3) feet below the finish floor elevation (FFE) of the process area (161'). The FFE of the chemical containment areas shall be approximately 158'. Each chemical has a dedicated room accessible by a double doorway and a

fiber-reinforced plastic (FRP) stairway and landing. Both raw and finish water mains cross through the chemical containment area along the western face of the building. Raw and finished water piping shall have a minimum clearance of 36-inches above FFE to avoid chemical contact in the event of a spill. Chemical containment volume is satisfied at 18-inches above FFE, including sprinkler volume. In the potassium hydroxide room, both raw and finish water piping turn down and penetrate the slab upon entrance and exit of the building, respectively. At this location, the ductile iron pipes shall be encased in concrete for up to 24-inches above FFE for protection from chemical contact and to ensure chemical containment. Each chemical containment area includes an accessible emergency eye-wash and shower.

PRESSURE FILTERS

Environmental Partners completed an evaluation of pressure filtration, using GreensandPlus™ filter media and LaneOx® filter media, for the removal of oxidized iron and manganese during the treatability study. Both filter systems remove iron and manganese particles to concentrations below the Secondary Standards, although GreensandPlus™ proved slightly more efficient than LaneOx™ within the study. Environmental Partners recommends allowing vendors of both systems the opportunity to bid, providing greater competition.

Oxidized raw water shall flow under pressure to the filter influent header, which distributes flow to each of the pressure filters. The proposed layout includes four (4) vertical filter vessels with associated valves, piping, and instrumentation. The vertical filter vessels are 10 feet in diameter, each with approximately 78 square feet of interior filter area. Based on the results of the treatability study, MassDEP has approved an average filter loading rate of 6 gpm/sf and a maximum filter loading rate of 9 gpm/sf. The loading rate will exceed 6 gpm/sf during backwashing operations.

Oxidized water flows into the top of the pressure vessel and through a filter bed consisting of 12 inches of anthracite, catalytic media (24 inches GreensandPlus™ or 30 inches of LayneOx), and 12 inches of gravel. Filtered water flows through an underdrain system and into the filtered water header. A differential pressure transmitter measures the headloss across the filter. An electrically actuated butterfly valve controls the flow of oxidized water to each filter. An electromagnetic flowmeter measures the flow. Manually operated valves on the filter influent and effluent allow for isolating individual vessels.

The expected filter run time is approximately 90 hours and will depend on raw water iron and manganese concentrations. After a preset duration of filter headloss of 8 to 10 psi, the filters will require backwashing. The filters are backwashed individually to clean suspended solids that are removed during the filtration process. Under normal operating conditions, the washwater supply is the filtered water from the remaining on-line filters. In an emergency, the washwater supply is finished water from the distribution system via an 8-inch by-pass connection and manually operated butterfly valve. A single positive displacement air blower is provided for air scour operations on a weekly basis. A combination of air scour and filtered water is proposed to clean the filter. The flow of air, backwash water, backwash wastewater, filter drain down, and filter to waste shall be controlled using electrically actuated valves. A typical backwash waste sequence consists of the following:

1. Isolation of the filter,

2. Drain down of the filter to the top of the filter media,
3. Air scour of filter media (once a week),
4. Combined air scour and water wash,
5. Slow refill of filter,
6. Backwash of filter,
7. Settling of the filter bed, and
8. Filter to waste to ripen filter before returning online.

Filter drain down, backwash waste, and filter to waste is directed to the backwash waste tanks.

FUTURE SECONDARY TREATMENT

The ever-evolving regulatory environment of public water systems mandates the need to assess the future treatment needs of the WTP. Regulation regarding the concentration of polyfluoroalkyl substances (PFAS) is expected to be enacted by MassDEP in late 2020. Current guidance and other state regulations require PFAS removal down to 20 parts per trillion. Environmental partners consulted with a granular activated carbon (GAC) filter manufacturer (TetraSOLV) for spacing considerations for future installation at the WTP. TetraSOLV recommends a lead-lag filer setup consisting of two 10-foot diameter filters to achieve maximum adsorption contact time. Space is provided in the facility for three lead-lag vessel units, capable of adequately treating between 1,000 to 1500 gpm depending on PFAS concentrations and final regulatory treatment standards. Additional vessels could be provided outside the footprint of the building if required. GAC filtration for PFAS removal would take place after iron and manganese removal filtration to provide maximum carbon bed life by removing raw water iron and manganese. The WTP includes provisions for three knock-out walls located on the eastern side of the facility for the installation of the future GAC contactors. A rigging company was consulted to review PFAS GAC contactor unloading and installation spacing requirements and sequencing; and the facility layout included these design provisions.

BACKWASH WASTE TANK

The proposed WTP includes a backwash waste tank for capturing treatment residuals produced during the backwash operations of the filter system. Sample sink and analyzer waste shall also be discharged to the backwash waste tanks. The backwash waste tank consists of two compartments. The combined volume of the compartments can hold 4 consecutive backwashes and sample sink/analyzer waste. The two compartments are hydraulically connected via a sluice gate weir. Under normal operating conditions, the backwash waste and sample sink/analyzer waste flow into both compartments with the sluice gate open. A backwash waste tank compartment can be isolated for maintenance and repair. Two vertical turbine pumps, one in each compartment, transfers the residuals into the Town sewer via 4-inch forcemain. The backwash waste flow is metered prior to discharge from the facility. See Attachment 1 – Hydraulics for a description of the backwash waste pumping system.

The vertical turbine pumps only activate at night when the demand on the sewer system is low. In periods of high sanitary sewage flow, the Town can suspend discharging to sewer altogether. The backwash waste tanks can hold the volume from four (4) backwashes and analyzer waste for 24 hours before requiring discharge to sewer. Depending on the loading rate, filters may require backwashing every 3-4 days. An emergency tanker truck connection was provided if the Town sewer system discharge is not available in an emergency condition.

DESIGN CRITERIA

Design criteria information for the WTP is outlined in the tables below:

Table 1 – Flow and Loads

Process	Parameter	Value	Unit
Raw	Flow	694 – 1535 (1.0 -2.21)	gpm (MGD)
	pH	5.8 – 6.2	Standard Units
	Alkalinity	24	mg/L CaCO3
	Iron	<0.1	mg/L
	Manganese	0.329-0.33	mg/L
Finished	Flow	694 – 2083 (1.0 -3.0)	gpm (MGD)
	pH	7.2	Standard Units
	Iron	<0.1	mg/L
	Manganese	<0.03	mg/L
	Chlorine	0.5-0.8 (function of flow)	mg/L

Table 2 – Chemical Feed and Storage

Process	Parameter	Value	Unit
Sodium Hypochlorite (Pre-filtration)	Average Dose	2.0	mg/L (as sodium hypochlorite)
	Supplied Form	Liquid	
	Feed Form	Liquid	
	Strength	12.5%	as sodium hypochlorite
	Frequency of Use	Continuous	
	Bulk Tank Volume	545	gallons
	Day Tank Volume	55	gallons
	# of Metering Pumps	2	
	# of Transfer Pumps	1	
Sodium Hypochlorite (Post-filtration)	Average Dose	1	mg/L (as sodium hypochlorite)
	Supplied Form	Liquid	
	Feed Form	Liquid	
	Strength	12.5%	as sodium hypochlorite
	Frequency of Use	As Needed	
	Bulk Tank Volume	545	gallons
	Day Tank Volume	30	gallons

Process	Parameter	Value	Unit
	# of Metering Pumps	2	
	# of Transfer Pumps	1	
Potassium Hydroxide (Pre-filtration)	Average Dose	25	mg/L (as potassium hydroxide)
	Supplied Form	Liquid	
	Feed Form	Liquid	
	Strength	50%	as potassium hydroxide
	Frequency of Use	Continuous	
	Bulk Tank Volume	1400	gallons
	Day Tank Volume	325	gallons
	# of Metering Pumps	2	
	# of Transfer Pumps	1	
Potassium Hydroxide (Post-filtration)	Average Dose	10	mg/L (as potassium hydroxide)
	Supplied Form	Liquid	
	Feed Form	Liquid	
	Strength	50%	as potassium hydroxide
	Frequency of Use	As Needed	
	Bulk Tank Volume	1400	gallons
	Day Tank Volume	120	gallons
	# of Metering Pumps	2	
	# of Transfer Pumps	1	
Future Sodium Bisulfite (Post-filtration)	Average Dose	10	mg/L (as potassium hydroxide)
	Supplied Form	Liquid	
	Feed Form	Liquid	
	Strength	30%	as sodium bisulfite
	Frequency of Use	As Needed	
	Bulk Tank Volume	115	gallons
	Day Tank Volume	10	gallons
	# of Metering Pumps	2	
	# of Transfer Pumps	1	

Table 3 – Pressure Filtration

Process	Parameter	Value	Unit
Filters	Design Flow Rate	694 – 1535 (1.0 -2.21)	gpm (MGD)
	Type & Size	Vertical, 10-ft Diameter	
	# of Filters	4	
	Filter Area (each)	78.5	square feet
	Maximum Approved Loading Rate	9	gpm/sq. ft.
	Anthracite Media	12	inches
	GreensandPlus Media	24	inches
	LayneOx Media	30	inches
	Gravel Layer	12	inches
	Expected Filter Run Time	90	hours
	Backwash System	Air/Water	
	Washwater Rate	12	gpm/sq. ft.
	Backwash Generated per Filter	12,601	gallons
	Estimated Backwash Frequency	3-4	days
	Washwater Supply	On-line Filters (Finished Water Emergency Only)	
	Air Scour Flow Rate	0.82	cfm/sq. ft.
	# of Air Scour Blowers	1	
	Air Scour Blower Capacity	65	cfm
	Air Scour Blower Size	5	HP

Table 4 – Backwash Waste and Recycling

Process	Parameter	Value	Unit
Backwash Waste Tank	Total Backwash Waste Flow	50,403	gallons
	Sample Line Flow	10,800	gallons
	Required Tank Capacity	61,203	gallons
	# of Compartments	2	
	Compartment Capacity, each	31,646	gallons
	Provided Tank Capacity	63,293	gallons
	Total Interior Tank Height	10.5	ft
	Freeboard	2.0	ft

ATTACHMENT 5

Instrumentation and Controls Technical Memorandum

ENVIRONMENTAL PARTNERS

TECHNICAL MEMORANDUM

Date: May 2020

To Maurice Goulet, Director of Public Works, Town of Medfield

From Eric Kelley, Project Manager, Environmental Partners

CC Paul Millett, Senior Principal, Environmental Partners
Dave Patangia, Principal, Environmental Partners
Tyler Schmidt, Project Engineer, Environment Partners

Subject Wells 3 & 4 Water Treatment Plant
Town of Medfield, Massachusetts
Instrumentation and Controls Technical Memorandum

This technical memorandum presents design information and details regarding the SCADA (Supervisory Control and Data Acquisition) and Instrumentation & Controls (I&C) systems for the Wells 3 & 4 Water Treatment Plant (WTP). This technical memorandum includes a review and description of proposed facilities, control strategy, division of work, and additional design considerations related to the SCADA and I&C system for the WTP. A SCADA schematic for the proposed project is provided in Attachment 11 – Preliminary Design Drawings.

EXISTING CONDITIONS

The Town of Medfield (Town) currently utilizes a licensed radio telemetry system (Teledesign TS4000) for communication between Well 3 and the Town's central SCADA nodes at the Wastewater Treatment Facility and Department of Public Works (DPW). Well 4 is currently off-line. The programmable logic controllers (PLCs) are a mix of vendors and Direct Logic Model-06 is mostly implemented throughout the water system. The current SCADA software includes IFix, Win 911, Classic Historian 5.99, and XL Reporter. Well 3 currently operates based on State Hospital or Mount Nebo tank levels as selected by the operators.

PROPOSED CONDITIONS

GENERAL

For the telemetry system, a new fiber-based communications system will be established between Well 3/3A, Well 4, and the proposed WTP. The use of fiber-based communications will replace the existing radio system at the well sites. The use of cellular communications, including primary and back-up, at the proposed WTP will facilitate communications between the WTP and SCADA node at the DPW. The current Teledesign radio system is no longer available, and a radio based system cannot support the data transfer requirements from the new WTP SCADA system. The Town may also consider a broadband connection at the WTP, in addition to cellular telemetry, but this communications system would require connection and monthly fees to a local provider.

A Main Control Panel (MCP) and human machine interface (HMI) computer terminal station will be located inside the proposed control room of the WTP. The HMI computer terminal will provide monitoring and control of the WTP equipment and processes, as well as access to the Town DPW SCADA system. The MCP will house the PLC, touch screen operator interface terminal (OIT), fiber switch, cellular modem, and uninterruptable power supply (UPS). The Town has standardized on Allen Bradley PLCs. The existing SCADA software will be maintained for the new WTP.

All WTP pumps, filter equipment and controls, air scour blower, stand-by generator, security system, other field equipment, and field instruments will be wired to the MCP. The pressure filtration system manufacturer will pre-package the filter related controls, and these instruments and loops will be directly integrated into the proposed MCP. Programming will be uploaded to the PLC to reflect the desired operating controls strategy for water treatment operations. A general summary of the process control strategy is provided below. In the event the HMI malfunctions, the treatment facility will have the ability to be controlled manually through the OIT located on the MCP. Security system still images can be viewed through the SCADA system at the DPW, and live streaming cannot be provided without a more robust telemetry system.

WTP Variable frequency drives, analyzers, pressure transmitters, level instruments, and flow meters will be installed for complete process control and monitoring of the proposed water treatment facility. Analytical instrumentation (pH/temperature and chlorine residual) will be provided throughout the treatment process and tied into the appropriate chemical feed and process control strategies. Chemical control stations will be provided for automatic and manual chemical feed control in accordance with MADEP Chapter 6 requirements. The chemical transfer pumps will be provided with a dead-man switch per MADEP requirements.

New control panels at each well will be provided with PLC, OIT, fiber switch, and UPS. Well pump variable frequency drives and instruments will be installed for completed process control and monitoring at each well site.

OVERALL CONTROLS STRATEGY

The overall control strategy for the water treatment plant includes:

- To measure and record plant raw water (Wells 3/3A and 4), backwash waste, and finished water flow rates.
- To monitor and control the pressure filtration process and associated process equipment, including filter valves and an air scour blower.
- To measure and record liquid levels in various chemical storage tanks.
- To provide control of sodium hypochlorite and sodium hydroxide chemical feed pumps.
- To monitor equipment operating status and to record motor run times and process variables.
- To monitor and record field instrument measurements including pressure, headloss, flow, pH/temperature, and chlorine residual.
- To monitor alarm status and to annunciate, record alarm events, and transmit designated alarms.
- To interlock chemical feed systems to Well stations, in compliance with MassDEP Chapter 6 chemical feed safety.

The WTP shall be controlled in two modes of operation: Manual and Automatic. The manual mode of operation will provide operator initiation or intervention of equipment operation. Each individual piece of equipment may be started in non-sequential order or without interlocked equipment. Safety interlocks will still operate to prevent damage or injury. In the automatic mode of operation, the proposed WTP and existing well stations will start/stop based on operator-selectable water storage tank level set-points (State Hospital and Mount Nebo), and therefore will maintain the current method for "on/off" control of the well stations. In the automatic start mode, the entire system shall operate, sequentially starting all subsystems.

DIVISION OF WORK

The Town currently utilizes Woodard and Curran (W&C) for SCADA and instrumentation and controls support and upgrades. Due to Massachusetts bid law requirements, W&C cannot be sole sourced to complete the work. The arrangements to include W&C for SCADA and instrumentation controls will be reviewed during final design. Typically, the MCP hardware and instruments are furnished and installed by the General Contractor for the project. SCADA HMI computer terminal stations, MCP, and well control panels can be programmed by the General Contractor or the Town's SCADA Integrator (W&C).

ADDITIONAL DESIGN CONSIDERATIONS

Additional items to consider for the next phase of design include:

- Finalize WTP telemetry communications design: broadband vs cellular;
- Develop a sequence of operations for daily start-up and shut down of the WTP when the facility is operated in automatic mode;

- Develop a sequence of operations to adjust WTP operations (pump speeds and filter backwash cycles) to meet an operator selectable finished water flow rate set point;
- Confirm Town preferred analyzers and instrument suppliers and vendors;
- Confirm security system design and requirements with Town vendor; and
- Coordinate W&C project involvement.

ATTACHMENT 6

Architectural Technical Memorandum

CGKV Architects, Inc.

204A Hampshire Street
Cambridge, MA 02139
Tel. 617-504-8196
Fax. 617-812-6364
cgkvarchitects.com

TECHNICAL MEMORANDUM

Date: May 1, 2020

From: Jason Knutson, AIA

To: Dave Patangia, PE, Principal – EP

Subject: Architectural Technical Memorandum

Reference: Wells 3 & 4 Water Treatment Plant
Medfield, Massachusetts

The purpose of this memorandum is to summarize the Architectural project elements for the proposed new Wells 3 & 4 Water Treatment Plant in Medfield, MA.

EXISTING CONDITIONS

The proposed water treatment plant for Wells 3 and 4 will be new construction. The site is generally wooded. The existing Well 3 and Well 4 buildings are nearby and are of brick and/or block construction.

PROPOSED CONDITIONS

1. General Description

   The proposed new water treatment plant will be a single-story structure approximately 60'-0" wide by 100'-0" long. The shell / structure will be a pre-engineered metal building with a gable roof (2:12 pitch).

   The building interior is arranged into four areas. The northwest corner is the filter area and will contain four pressure filter vessels. The southwest corner houses three enclosed chemical storage areas – NaOH, NaOCl, and future NaHSO3. These spaces are recessed 3'-0" below the main floor level. The southeast corner includes the control room / laboratory, electrical room, mechanical room, and an accessible toilet room. The Northeast corner is intended to house a potential future GAC pressure filter system.

   An upper level will be created above the enclosed spaces at the southwest and southeast corners of the building to house HVAC equipment. Access to the upper level will be limited to maintenance activities only.

Most areas of the building require a minimum interior clear height to the bottom of the roof structure of around 17'-0". The future GAC pressure filter area requires a minimum interior clear height of around 24'-0". The roof height will step up from south to north in response to the different minimum height requirements.

2. Foundation and Slab

- Cast-in-place concrete foundations.
- 8" tall cast-in-place concrete curbs at building perimeter and at the base of interior partitions.
- Foundation walls and floor slabs will be insulated in accordance with the energy conservation code.
- Foundation walls will be waterproofed with modified bituminous sheet waterproofing and molded sheet drainage panel system.
- Above grade foundation insulation will be protected behind stainless steel flat seam flashing.
- The floor will generally be a reinforced concrete slab or mat on grade. There will be a below grade concrete backwash waste tank at the northwest corner of the building.
- The concrete slab on grade will be placed over a vapor retarder. The need for blindside waterproofing under the concrete backwash waste tank must still be determined.
- Refer to the Structural Technical Memorandum for additional information.

3. Structure and Shell

- Rigid frame clear span steel structure at interior bays and post & beam multi span steel structure at end walls – provided by pre-engineered metal building manufacturer.
- Steel purlin roof framing and steel inset girt wall framing – provided by pre-engineered metal building manufacturer.
- Steel wall framing for framed exterior openings (e.g. – windows and doors) – provided by pre-engineered metal building manufacturer.
- Insulated (sandwich) metal roof panels, approx. 4" thick (U-0.035 max.), with concealed fasteners and rolled standing seams – provided by pre-engineered metal building manufacturer. [Basis of Design (B.O.D.): MBCI CFR Insulated Roof Panel.]
- Insulated (sandwich) metal wall panels, approx. 3" thick (U-0.052 max.), with concealed fasteners – provided by pre-engineered metal building manufacturer. [B.O.B.: MBCI CF Mesa Insulated Wall Panel.]
- Metal ridge trim, rake trim, gutters, downspouts, and framed opening trim – provided by pre-engineered metal building manufacturer.

- Snow rails will be installed at the eaves.
- The pre-engineered metal building assembly will also feature a canopy over the main entrance door.
- To facilitate future installation of the GAC pressure filter system, the east elevation will include three large "knock-out" panels, approximately 12'-0" wide by 22'-0" tall. It is proposed that the "knock-out" panels be constructed with fiberglass sandwich panel assemblies (see Part 5, below).

4. Exterior Doors and Frames

- Exterior personnel doors to have thermally-broken steel or aluminum frames.
- Exterior personnel doors to be FRP / aluminum hybrid with glazed vision lites. [B.O.D.: Special-Lite SL-17 or SL-20.]
- Exterior personnel door hardware to include continuous geared aluminum hinges, exit devices, door closers, threshold, and perimeter weatherstripping.
- Vertical coiling insulated service door at north elevation, manual (or powered – to be confirmed) operation. [B.O.D.: McKeon Climateguard IS3000 Series.]

5. Exterior Windows and Daylighting

- Horizontal gliding vinyl window(s) (U-0.45 max.) will be provided at the control room / laboratory. [B.O.D.: Harvey.]
- Fixed vinyl windows (U-0.45 max.) will be installed to provide a view from the exterior chemical fill stations to the interior chemical storage tanks.
- It is recommended that all exterior windows be protected with exterior security screens. [B.O.D.: Avant Guards Slimline Security Screen, Level 5.]
- Fiberglass sandwich panel assemblies will be installed at clerestory height on the west elevation to provide daylighting to the building interior. [B.O.D.: Kalwall Corp. Translucent Wall System.]
- Fiberglass sandwich panel assemblies will also be used as the "knock-out" panels on the east elevation.

6. Exterior Louvers

- Refer to HVAC Technical Memorandum.

7. Interior Partitions

- The enclosed spaces within the building shell at its southern end will be constructed of 8" CMU.

- Walls at the open northern end of the building, containing the filter area and the future GAC pressure filter system, will be the metal backside of the exterior insulated metal wall panels.

8. Interior Ceilings

- The ceiling of the shell will be the exposed roof structure and the underside of the insulated metal roof panels.
- The "roof" structure for the enclosed spaces at the southern end of the building will be constructed with pre-cast concrete planks. The ceiling in the chemical storage areas, the mechanical room, and the electrical room will be the exposed underside of these pre-cast concrete planks.
- Finished ceilings in the control room and the toilet room will be 2 x 2 suspended acoustical ceiling tiles.

9. Interior Floor

- All interior floors will be sealed concrete.
- Vinyl base will be installed at the control room and toilet room.
- Floor work pads/matts will be provided in the control room for operator comfort.

10. Interior Doors and Windows

- Interior doors to have steel or aluminum frames.
- Interior doors to be FRP / aluminum hybrid. [B.O.D.: Special-Lite SL-17 or SL-20.]
- Interior door hardware to include continuous geared aluminum hinges, exit devices (where required by code), locksets, and door closers.
- Fixed windows (hollow metal frame, tempered insulated glass) will be installed to provide views out of the control room to the process areas.

11. Painting / Finishes

- All exposed CMU walls will be painted.
- The control room and the toilet room floors will be painted with an epoxy coating.
- The chemical storage recessed containment areas will be provided with special protective coatings suitable for the stored materials.

12. Toilet Room Fixtures

- Toilet room fixtures include ADA-compliant water closet (wall-mounted) and ADA-compliant lavatory (wall-mounted).
- Toilet room will include ADA-compliant grab bars, paper towel dispenser, toilet paper dispenser, and other appurtenances.
- A custodial floor sink will be located in the mechanical room.

13. Laboratory FF&E

- The control room / laboratory will be furnished with base cabinets, wall cabinets, and a chemical-resistant countertop.
- Other laboratory FF&E includes a fume hood, two sinks, a refrigerator, an ice maker, and a desk and chair(s).

14. Fiberglass Guard Rails and Stairs

- The recessed floor of the chemical containment areas will be accessed via OSHA-compliant fiberglass stair assemblies.
- Removable OSHA-compliant fiberglass guardrails will be installed at the open containment area edges.

15. Access Ladders and Hatches

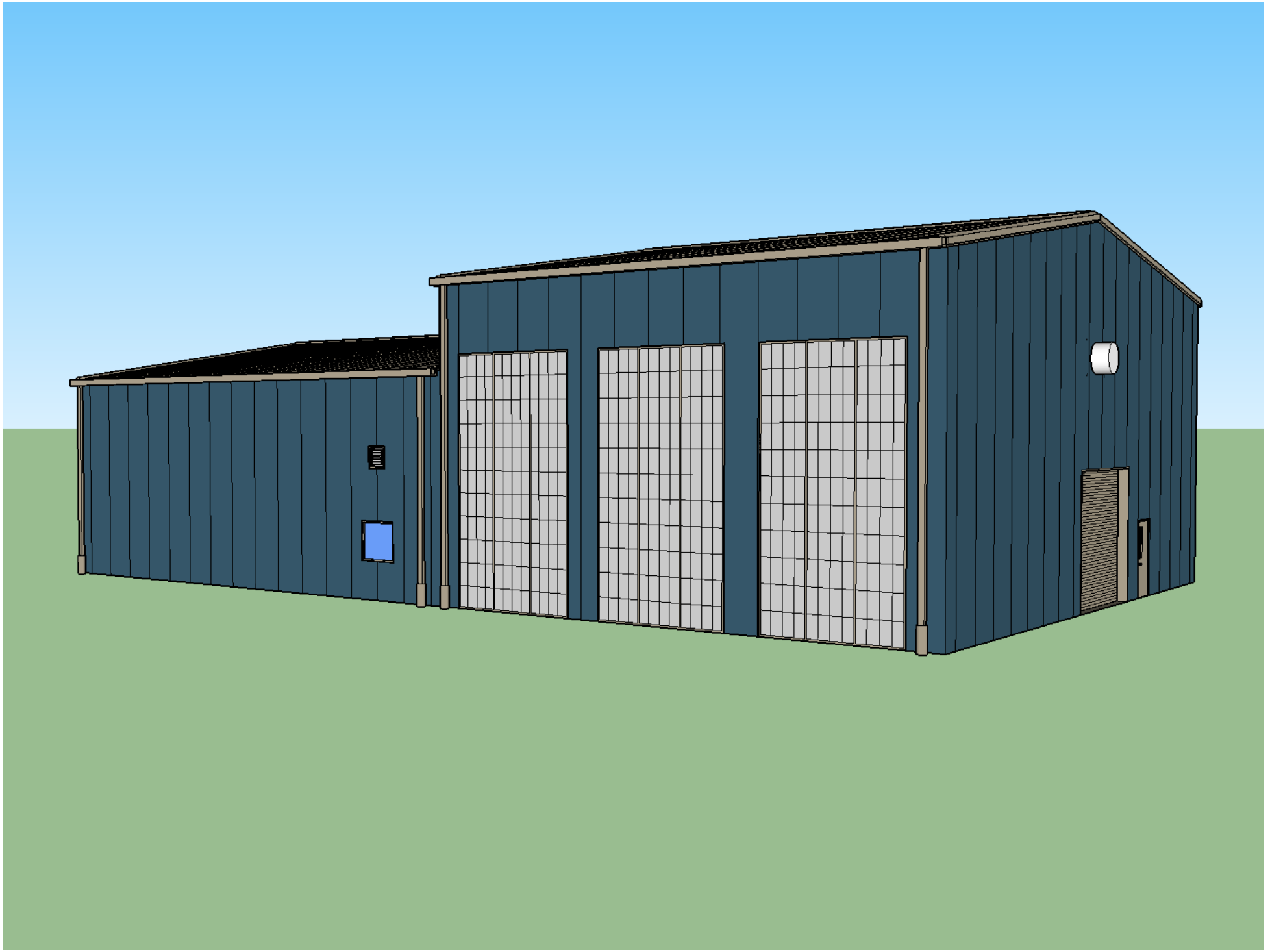
- Access to the upper level will be via a fixed ladder with heavy duty extruded aluminum siderails and rungs. [B.O.D.: O'Keeffe's Model 501.]
- Access to the backwash waste tank will be via aluminum floor doors cast into the concrete floor slab. [B.O.D.: Acudor AW-APS.] Fall protection safety nets will be provided at all floor doors.
- Stainless steel access ladders, with retractable ladder-assist posts, will be installed at each floor door.
- Refer to Structural Technical Memorandum for additional information.

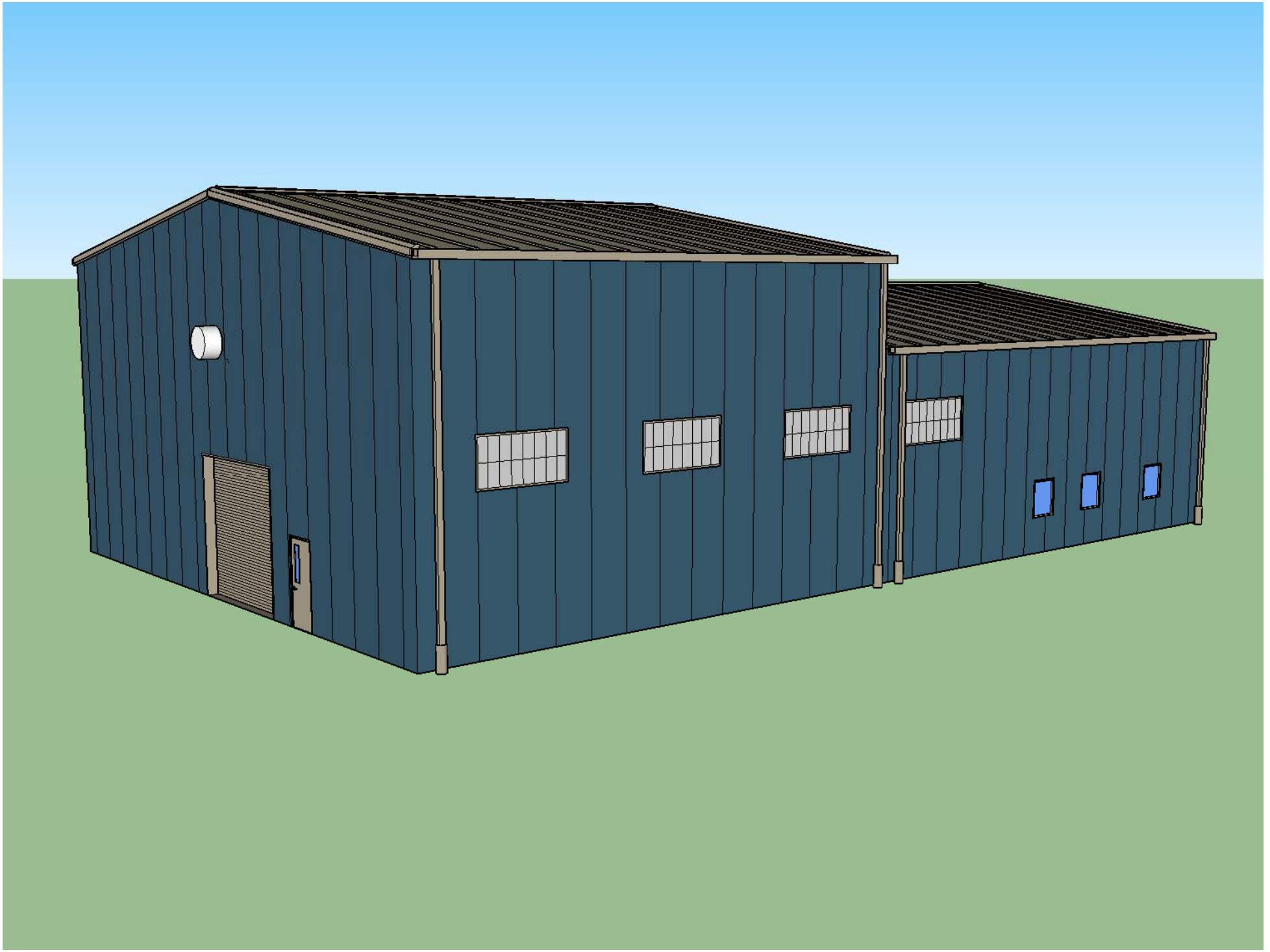
16. Code Summary

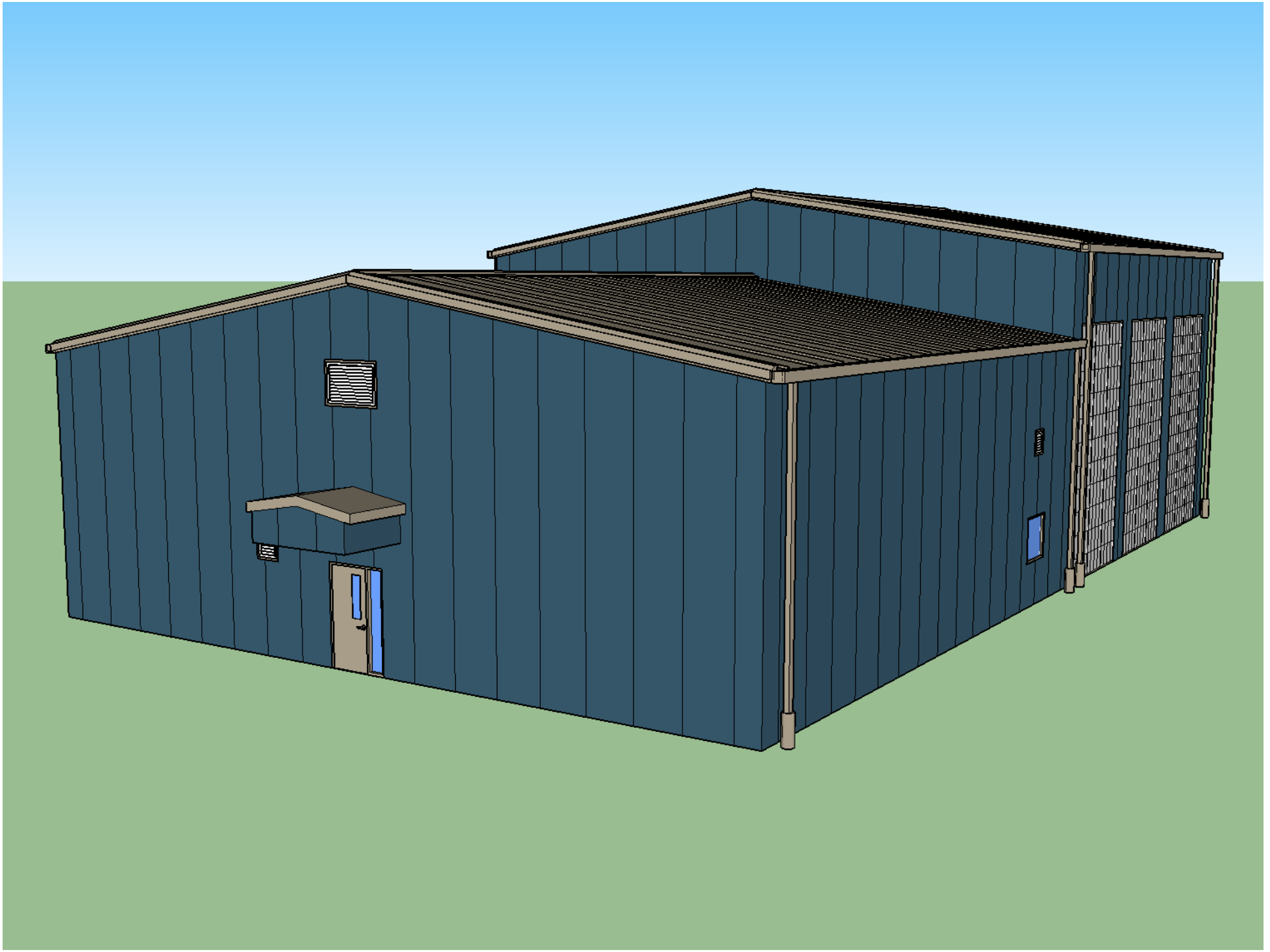
- Refer to the attached preliminary Code Summary, prepared by Hastings Consulting, dated April 13, 2020.

ADDITIONAL DESIGN CONSIDERATIONS

- Consider adding a vestibule at the main building entrance for energy conservation and comfort.
- Consider ceramic tile wall and/or floor finishes in the toilet room.
- Consider vinyl or rubber tile floor finish in the control room for operator comfort.
- Confirm detailed furniture, fixtures, and equipment requirements for the Control Room / Laboratory. [e.g. – wood or laminate cabinets, countertop material, glass or solid cabinet doors, drawer and shelf configurations, etc.]
- Investigate possible graffiti-resistant exterior wall panel coatings.
- Consider painting exposed structural steel at the interior.







CODE SUMMARY

Medfield Water Treatment Plant
Medfield, Massachusetts

April, 13 2020

Prepared by: Kevin S. Hastings, P.E., LEED AP

Code Type	Applicable Code (Model Code Basis)
Building	780 CMR: Massachusetts State Building Code, 9th Edition (2015 International Building Code)
Fire Prevention	527 CMR: Massachusetts Fire Prevention Regulations (2015 NFPA 1)
Accessibility	521 CMR: Massachusetts Architectural Access Board Regulations Americans with Disabilities Act
Electrical	527 CMR 12.00: Massachusetts Electrical Code (2020 National Electrical Code)
Mechanical	2009 International Mechanical Code (IMC)
Plumbing	248 CMR: Massachusetts Plumbing Code
Energy Conservation	2015 International Energy Conservation Code (IECC)[A]

A. Compliance with the 2018 IECC is mandatory for building permit applications beginning on August 7, 2020.

1. Use Group Classification

Use Group H-4 (High-Hazard- Health)

As summarized in the table below, since the building will contain corrosive chemicals above the exempt limits in IBC Table 307.1(2) it must be classified as a Use Group H-4 occupancy.

Chemical Name	Building Code Classification	Proposed Storage Quantity	Building Code Exempt Storage Limit
Sodium Hypochlorite - 15% (NaOCl)	Corrosive	605 gallons	500 gallons 1000 gallons w/sprinklers
Sodium Hydroxide 50%	Corrosive	1,725 gallons	500 gallons 1000 gallons w/sprinklers
Sodium Bisulfite 30% (Future)	Not Classified	125 gallons	-

2. Minimum Construction Type

Type VB (combustible, unprotected)

3. Height and Area Limitations

Use Group H-4 / Construction Type VB

	Height	Area
Tabular Value (IBC Tables 504.3, 504.4 & 506.2)	2 St. (40 ft)	6,500 ft^2
Frontage Increase IBC Section 506.2 100% Open Perimeter	-	+4,875 ft^2
Total Allowed	2 St. (40 ft)	11,375 ft^2
Actual	1 St.	6,000 ft^2

4. Fire Ratings

Building Element (IBC Table 601)	**Type VB** **Ratings in Hours**
Primary Structural Frame	0
Exterior Bearing Walls including columns along the exterior wall	0
Exterior Non-Bearing Walls (IBC Table 602)	0 Fire separation distance is greater than 10 feet.
Interior Bearing Walls	0
Floor Construction	0
Roof Construction	0

5. Interior Finishes

IBC Table 803.11	Use Group H-4	
	With Sprinklers	Without Sprinklers
Rooms & Enclosed Spaces	Class C	Class B

6. Means of Egress

Occupant Load (IBC Table 1004.1.2)

Space	Area	Occupant Load Factor	Occupant Load
Water Treatment & Utility Spaces	6,000 sqft.	300 sqft. / person (Mechanical Equipment Room)	20
		Total =	20

Minimum # of Exits: (IBC Table 1006.3.1)	The proposed building will have two exterior doors located at opposite ends of the building that provide adequate means of egress.
Max. Travel Distance: (IBC Table 1006.2.1) (IBC Table 1017.2)	The maximum common path of travel in Use Group H-4 is 75 feet and the maximum overall travel is 175 feet. The actual maximum common path of travel distance is approximately 30 feet and the maximum overall travel distance is approximately 75 feet.
Panic Hardware (IBC 1010.1.10)	All egress doors serving Use Group H areas require panic hardware and must swing in the direction of egress.

7. Required Fire Protection Systems

NFPA 13 Sprinkler System (780 CMR Table 903.2)
Fire Alarm System (780 CMR 903.4.2)
Automatic Fire Detection System (780 CMR 415.3)
Fire Extinguishers (780 CMR 906.1)

8. Accessibility for Persons with Disabilities

Massachusetts Architectural Access Board Regulations

Since the building will not be open to the public, it is not required to comply with the regulations of the Massachusetts Architectural Access Board (521 CMR Section 11.1).

American's with Disabilities Act

The ADA Guidelines are not enforced by the Commonwealth of Massachusetts, they can only be enforced through a civil lawsuit or complaint filed with the U.S. Department of Justice. The ADA does require that employee work spaces are designed to allow employees to approach, enter, and exit the work area (ADA Section 203.9). However, the work areas are not required be provided with accessible features (i.e. work sinks, shelves, etc.). Spaces frequented only by service personnel for maintenance, repair, or occasional monitoring of equipment shall not be required to comply with these requirements or to be on an accessible route (ADA Section 203.5).

8. Hazardous Material Requirements

Since the building will utilize hazardous materials, the following additional protection features are required:

Ventilation (IBC 414.3)	Rooms where corrosive mists, fumes or vapors may be emitted due to the use, handling or storage of the corrosive material must be provided with a mechanical ventilation system in accordance with the International Mechanical Code. If mechanical ventilation is required, a manual shutoff control for the system must be provided outside the room adjacent to the entrance door. If required, the ventilation system must also have standby or emergency power unless an approved fail-safe engineered system is installed (IBC 414.5.4).
Spill Control (IBC 414.5.3)	Spill control is required in accordance with the International Fire Code (IFC). The IFC requires spill containment in rooms storing hazardous materials in individual vessels larger than 55 gallons or in which the aggregate capacity of vessels exceeds 1,000 gallons (IFC 5004.2.1). The containment system must be capable of containing a spill from the largest single storage vessel plus 20 minutes of sprinkler water in the

	roof or area in which the storage vessel is located (IFC 5004.2.2.3).
Emergency Alarms (780 CMR 415.5)	A manual emergency alarm system must be provided outside the area where hazardous materials are stored to activate a local alarm throughout the building in an emergency situation (non-fire).

ATTACHMENT 7

Structural Technical Memorandum

STRUCTURAL NARRATIVE

The proposed Water Treatment Plant in Medfield, Massachusetts is a 6,000 SF single story pre-engineered metal building structure. The building structure, approximately 60' wide by 100' long, is rectangular in shape with gable roof.

First floor level is primarily process floor occupied with depressed three (3) chemical storage rooms, mechanical room, toilet, electrical room, control room and process treatment filter vessels. The backwash waste tanks at the ground floor located below the first floor slab. The upper floor plan above the chemical storage rooms is for the HVAC equipment. Superstructure of the building is pre-engineered metal building structure with a low and high roof.

First floor slab is anticipated to be a combination of concrete slab resting directly on grade and structural framed concrete over below grade tank. Typical slab on grade and the structural framed concrete slab over below grade tanks will be 12" thick. The concrete mat supporting the first floor depressed chemical rooms will be 18" thick and the concrete mat supporting the ground floor backwash waste tanks will be 24" thick to support the loads imposed upon them.

The below grade backwash waste tanks will be reinforced concrete structure resting on well compacted gravel over excavated grade. 8" thick precast concrete hollow-core plank floor supported by 8" masonry bearing walls are constructed above all of the rooms at the first floor.

The metal building structure configuration, gravity and lateral resisting system will be designed and fabricated by the metal building manufacturer to meet design load requirements. At grade level, lateral forces will be resisted by a combination of frictional resistance and passive pressure provided by the soil.

Refer to the first floor plan drawing S-1 for additional information and detail of the proposed structure.

GENERAL

- Structural work shall conform to the ninth edition of the Massachusetts State Building Code -780 CMR (MSBC) and Appendix C of ACI-350.

DESIGN LOADS

- Live Load: Process Area: 250 psf + Equipment weight
  Upper Floor above Chemical storage rooms: 150 psf + Equipment weight
  Upper Floor above Other rooms: 100 psf

- Snow load: Ground snow load, p_g = 40 psf
  Exposure "B", C_e = 0.9
  Thermal, C_t = 1.0
  Importance Factor, I_s = 1.1 for Risk Category III
  Flat Roof Snow Load, p_f = 35 psf (roof slope equal to or less than 5 degree)
  Unbalanced, Drifting and Sliding Snow per MSBC

- Wind load: Ultimate Design Wind Speed, V_{ult} =139 mph
  Risk Category III
  Wind Exposure B

- Seismic load: Earthquake Design Factors:
  S_S=0.191, S_1=0.066
  Site Class "D"
  Importance Factor, Ie = 1.25 for Risk Category III
  SD_S=0.204, SD_1=0.106

Seismic Design Category "B"

MATERIALS

- Steel Deck, G90 Galvanized — ASTM A446, 33 Ksi
- Cast in Place Concrete — F'c = 4,500 psi min.
- Precast Concrete Hollow-Core Plank — F'c = 4,500 psi min.
- Concrete Admixtures — ASTM C494
  - Mid to High Range Water Reducer
  - Air Entraining Agent
  - Crystalline densifying admixture for below grade tankage
- Reinforcing Steel
  - Bars — A615, Fy = 60 Ksi
  - Welded Wire Mesh — A185 Flat Sheets
  - Hot-dipped Galvanized — ASTM A123
- Reinforced Concrete Masonry (Inspected)
  - Normal Weight Block, Type N-1 — ASTM C90
  - Compressive Strength — f'm = 2500 psi
  - Mortar, Type S — f'c = 1800 psi
  - Grout — f'c = 2500 psi
  - Joint Reinforcements — ASTM A951, Galv.
  - Bar Reinforcements — A615, Fy = 60 Ksi

ATTACHMENT 8

Mechanical, Electrical, & Plumbing Technical Memorandum

SAR Engineering, Inc.

BASIS OF DESIGN

TOWN OF MEDFIELD
WELLS 3A & 4 WATER TREATMENT PLANT

MAY, 2020

PREPARED BY:

SAR Engineering, Inc.
150 Grossman Drive, Suite 309
Braintree, MA
617-221-9200

Project No. 20007.00

I. Fire Protection

A. Applicable Codes and Standards

1. The Fire Protection systems if installed shall comply with the following standards:

   a. Massachusetts State Building Code 780 CMR.

   b. NFPA 13.

B. The State Building Code Table 903.2 requires the entire building to be protected by an automatic fire sprinkler system. A variance with the town's building department and fire department will be filed to eliminate the automatic sprinkler system as the building will be protected with a full building fire monitoring and alarm system.

C. If the town's building department or fire department does not allow the code variance then the entire building will be protected with a wet sprinkler system per NFPA 13. The fire protection system would be designed for ordinary hazard sprinkler coverage throughout the building due to its H-4 building classification.

II. Plumbing

A. Applicable Codes and Standards

1. The Plumbing systems shall comply with the following standards:

   a. Massachusetts State Building Code 780 CMR.

   b. Massachusetts State Plumbing Code 248 CMR.

   c. 2018 International Energy Conservation Code.

B. Domestic Water Service

1. A 2-inch domestic water service with a backflow preventer shall be provided.

2. Cold water connections to the water closet, lavatory, and the emergency eyewash showers shall be provided.

3. All exposed cold water piping shall be insulated.

C. Domestic Hot Water

1. Two gas fired instantaneous, tankless type water heaters, complete with controls and connection to a master controller for automatic temperature control shall be provided. The heaters shall provide 140 deg F water for mixture at the fixtures to supply 65 deg F water to the eyewash/showers as required by 248 CMR and to the Restroom lavatory. The water heaters shall be located in the mechanical room.

2. A wall mounted programmable master controller located in the mechanical room shall provide sequencing of the water heaters for proper operation.

3. A hot water recirculation pump and piping from the water heaters to the Emergency Eyewash/Shower fixtures shall be provided. Hot water connections to the lavatory, janitor's sink, and the emergency eyewash showers shall be provided.

4. Each emergency eyewash/shower shall be furnished with a dedicated temperature mixing valve.

5. All exposed cold water, hot water and tempered water piping shall be insulated.

D. Plumbing Fixtures

1. A floor mounted, white vitreous china water closet with high efficiency, manual flush valve to meet current water conserving code requirements per 248 CMR shall be installed.

2. A wall hung, white vitreous china lavatory with dual handled faucet with low flow aerator to meet current water conserving code requirements per 248 CMR shall be provided. A point of use mixing valve shall be installed and piped to the lavatory from the cold and hot water systems.

3. Two new hose bibs with integral vacuum breakers in the Filter Area shall be provided. One hose bib with integral vacuum breakers shall be provided in each chemical storage room at the room platform.

4. Four exterior wall hydrants with integral vacuum breakers shall be provided.

5. An emergency eyewash/shower fixture shall be in each of the three chemical rooms.

6. A janitor's sink shall be located in the Mechanical Room.

7. Floor drains throughout the Filter Area and Future PFAS Area shall be provided.

E. Waste and Vent Systems

1. Heavy duty, cast-iron piping with gasketed hub and spigot joints for new below grade piping and no-hub piping with four banded and six banded couplings for accessible and exposed connections shall be provided.

2. A 4" through roof vent with copper piping shall be provided.

3. Waste and vent connections to the water closet, the lavatory and floor drains shall be provided.

F. LP Gas

1. A LP gas service with a tank, vaporizer and first and second stage regulators shall be provided.

2. Gas supply piping above ground shall be steel with threaded malleable iron or forged steel socket weld fittings sized to meet gas-fired equipment demand.

3. An above ground 2000 gallon LP tank size for an LP gas load of approximately 1810 cfh shall be provided and located at least 25' from the building. The tank will provide approximately 35 hours of operation during a utility power outage with the generator running at 100%, however the generator on average will be running around 75% loaded in which the building will have approximately 46 hours of standby operation.

4. A gas vaporizer equal to an ALGAS SDI DF 80/40 direct fired vaporizer shall be provided and shall be located approximately 10' from the LP tank.

5. The LP gas supply pipe size shall be 1-1/4inch to 1-1/2inch depending on distance the installed gas-fired equipment is from the tank location.

III. HVAC

A. Applicable Codes and Standards

1. The Heating, Ventilating and Dehumidification systems shall comply with the following standards:

a. Massachusetts State Building Code 780 CMR.

b. 2015 Mechanical Code Chapter 4 Ventilation for occupied areas.

c. 2015 International Mechanical Code sections 502.8.1.1 and 1105 for exhaust requirements, including Chemical Storage Rooms.

d. 2018 International Energy Conservation Code.

B. Ventilating Systems

1. An in-line exhaust fan shall be provided and installed; supported off the concrete plank deck over the NaOH Room. The fan shall be ducted to exhaust the three Chemical Storage Rooms. The ducted exhausts for each room are described below. The fan shall exhaust through a wall louver to the outdoors on the west side of the building. Exhaust fan internals shall be coated with corrosion resistant coating and fan shall run continuously. Install an Exhaust Fan manual shutoff wall switch and emergency shutoff signage outside the storage room entrance door.

2. NaOH Room

a. Ducted exhaust shall be provided sufficient to exhaust 1 cfm of air per square foot of floor space to comply with provisions of the International Mechanical Code. A Makeup Air Wall Cap shall be provided and installed in the North wall to replace the exhausted air. Ductwork components in the supply and exhaust airstreams shall be constructed of PVC. Exhaust duct shall run to 12 inches above floor.

3. NaOCl Room

a. Ducted exhaust shall be provided sufficient to exhaust 1 cfm of air per square foot of floor space to comply with provisions of the International Mechanical Code. A Makeup Air Wall Cap shall be provided and installed in the North wall to replace the exhausted air. Ductwork components in the supply and exhaust airstreams shall be constructed of PVC. Exhaust duct shall run to 12 inches above floor.

4. $NaHSO_3$ Room

a. Ducted exhaust shall be provided sufficient to exhaust 1 cfm of air per square foot of floor space to comply with provisions of the International Mechanical Code. A Makeup Air Wall Cap shall be provided and installed in the North wall to replace the exhausted air.

Ductwork components in the supply and exhaust airstreams shall be constructed of PVC. Exhaust duct shall run to 12 inches above floor.

5. Filter Area and Future PFAS Area

   a. A wall mounted dome fan shall be provided to exhaust 0.5 cfm of air per square foot of floor space to comply with provisions of the International Mechanical Code. Exhaust fan internals shall be coated with corrosion resistant coating and fan shall run upon activation of a manual wall switch located by the personnel entrance doors (total of two manual switches) or when the wall mounted Refrigerant Monitoring System enters an alarm condition or when a wall mounted CO2 sensor setpoint is reached. Install a Makeup Air Wall Louver and control damper in the wall opposite the fan to replace the exhausted air. Ductwork components in the supply and exhaust airstreams shall be constructed of 316 stainless steel. Supply and exhaust duct shall be minimal.

6. Control Room

   a. A wall mounted fan shall be provided to exhaust 40 cfm of air for ventilation to comply with provisions of the International Mechanical Code. Exhaust fan shall be started and stopped by the room light switch. A Makeup Air Wall Cap shall be installed in the wall and ducted to the Split System Heat Pump in the Room to distribute the supply air. Ductwork components in the supply and exhaust airstreams shall be constructed of galvanized steel.

   b. A Fume Hood shall be provided to exhaust 500 cfm of air used for analysis and testing purposes. Fan shall be controlled by a VFD for speed control. The hood, fan and ductwork shall be constructed of materials resistant to corrosive chemicals.

   c. A Makeup Air Unit shall be provided and located over the Control Room. Unit shall provide 500 cfm of air to supply the Fume Hood. Unit shall consist of a supply fan, gas burner and discharge duct connection. Unit fan shall be controlled by a VFD and shall be interlocked with the Fume Hood so it runs when the Fume Hood runs. Unit and ductwork shall be constructed of galvanized steel.

7. Electrical Room

   a. A wall mounted fan shall be provided sized to exhaust sufficient air for heat removal of electrical equipment in the room. Exhaust fan

shall cycle in response to a wall mounted thermostat. A Makeup Air Wall Cap shall be installed in the wall to allow outdoor air into the room to replace the air exhausted.

8. Mechanical Room

    a. A wall mounted fan shall be provided sized to exhaust sufficient air for heat removal of equipment in the room. Exhaust fan shall cycle in response to a wall mounted thermostat. A Makeup Air Wall Louver shall be provided and installed in the wall to allow outdoor air into the room to replace the air exhausted.

9. Toilet

    a. A wall mounted fan shall be provided and sized to exhaust 70 cfm of air for ventilation of the bathroom fixtures. Exhaust fan shall cycle in response to the wall mounted light switch. Makeup air shall be allowed to transfer from other spaces to replace the air exhausted. Ductwork components in the exhaust airstream shall be constructed of galvanized steel.

C. Heating and Cooling Systems

1. NaOH Room

    a. An electric ceiling hung corrosion resistant unit heater (Such as QMark JUW series) shall be provided and sized to maintain a space temperature of 65 deg F. Heater shall be controlled by a wall mounted thermostat. Preliminary size is 12KW.

2. NaOCl Room

    a. An electric ceiling hung corrosion resistant unit heater (Such as QMark JUWseries) shall be provided and sized to maintain a space temperature of 50 deg F. Heater shall be controlled by a wall mounted thermostat. Preliminary size is 7.5KW.

3. $NaHSO_3$ Room

    a. An electric ceiling hung corrosion resistant unit heater (Such as QMark JUWseries) shall be provided and sized to maintain a space temperature of 50 deg F. Heater shall be controlled by a wall mounted thermostat. Preliminary size is 7.5KW.

4. Filter Area and Future PFAS Area

a. A quantity of four ceiling mounted gas fired unit heaters with sealed combustion shall be provided in the Filter Area and Future PFAS Area. Unit heaters shall be sized to maintain a space temperature of 50 deg F. Heaters shall be controlled by wall mounted thermostats. Preliminary size of unit heaters is 60 Mbh input.

5. Control Room

a. A Ductless Split System Heat Pump consisting of a ceiling cassette Fan Coil and an Outdoor Unit shall be provided and will be sized to maintain a space temperature of 75 deg F during the cooling season and 70 deg F during the heating season. System shall be controlled by a wall mounted programmable thermostat. A 4-inch ventilation air duct shall be provided and run to the Fan Coil from a Wall Cap. Preliminary capacity is 2 tons. It should be noted that operation of the Fume Hood could result in temperature excursions to perhaps 78 to 80 degrees above the normal room cooling setpoint during those intervals when the Fume Hood is in operation.

6. Electrical Room

a. An electric ceiling hung unit heater shall be provided sized to maintain a space temperature of 50 deg F. Heater shall be controlled by a wall thermostat. Preliminary capacity is 5 KW.

7. Mechanical Room

a. An electric ceiling hung unit heater shall be provided sized to maintain a space temperature of 50 deg F. Heater shall be controlled by a wall thermostat. Preliminary capacity is 3 KW.

8. Toilet

a. An electric ceiling hung unit heater shall be provided sized to maintain a space temperature of 50 deg F. Heater shall be controlled by a wall thermostat. Preliminary capacity is 3 KW.

D. Dehumidification Systems

a. A Split System Dehumidification Unit shall be provided for the Filter Area and Future PFAS Area. System shall be sized to maintain the space temperature at 75 deg F dry bulb with 40% relative humidity and a dew point of 50 deg F. System will be designed for recirculation service with no outdoor air. An indoor Air Handler will

cool and dehumidify the air and discharge the air into the room via a short length of 316 stainless steel ductwork. A pvc condensate drain will be piped to outdoors to discharge the condensed water from the Air Handler. A wall mounted controller will control the system and cycle the unit dehumidifier section to maintain the desire space conditions. A condensing unit placed outside will reject the captured space heat. Preliminary unit selection is a Desert Aire LW 15 with a capacity of roughly 13 tons cooling and the associated outdoor Condensing Unit.

IV. Electrical

A. Applicable Codes and Standards

1. The Electrical systems shall comply with the following standards:

a. Massachusetts State Building Code 780 CMR.

b. 2020 Massachusetts Electrical Code

c. NFPA 72 2019 – National Fire Alarm and Signaling Code

d. 2018 International Energy Conservation Code.

B. Power System

1. Electrical Service

a. The electrical service shall be a 480V/277 Volt, 3-phase, 4-wire, 600 Amp service.

b. In the vicinity of the treatment plant building an 8’x8’ utility transformer pad and oil containment curb shall be provided.

c. An underground concrete encased primary utility ductbank from the new transformer location to a nearby utility pole shall be installed. Eversource will provide and install the transformer and primary lines in the ductbank.

d. A utility metering cabinet and utility meter shall be provided and located on the exterior building wall of the electrical room.

2. Power Distribution Equipment and Generator.

a. In the electrical room a 480 Volt, 3-phae, 4-wire, 600 Amp main circuit breaker (MCB) shall be provided. A 600 Amp service underground ductbank from the new transformer location to the new main MCB shall be installed.

b. A 400KW derated for 295kW with propane fuel, 480 Volt, 3-phase, 4-wire exterior propane gas fired engine generator with weatherproof sound attenuated enclosure shall be provided.

c. In the electrical room a wall mounted 600 Amp automatic transfer switch (ATS) and 600 Amp generator power disconnect switch shall be provided. A 600 Amp ductbank from the new generator to the ATS via the generator disconnect switch shall be installed.

d. In the electrical room a 480 Volt, 3-phase, 4-wire, 800 Amp main distribution panelboard (MDP) with a 600 Amp main circuit breaker, surge protection device, power metering, and feeder circuit breakers shall be provided. The MDP will be connected to the load side of the ATS. The MDP panelboard shall provide 480V power to the following loads.

(1) Well Pump Station #3A
(2) Well Pump Station #4
(3) 75KVA Transformer
(4) Backwash Pump #1 & #2
(5) Air Scour Blower
(6) Dehumidifier Unit DHU-1
(7) Dehumidifier Condenser ACCU-1
(8) Electric Unit Heaters EUH-1 Thru EUH-6
(9) Make Up Air Unit MAU-1
(10) Hood Exhaust Fan HEF-1

e. A 250 Amp underground feeder from the MDP to the Well Pump Station #3A shall be provided. The station's existing utility service including the overhead primary lines, the associated utility poles, the meter, the generator and the automatic transfer switch shall be removed. The feeder from MDP will be connected to the well station's main 480V panelboard. The generator and transfer switch shall be salvaged and handed back to the town for their use at future well station.

f. A 200 Amp underground feeder from the MDP to the Well Pump Station #4 shall be provided. The station's existing utility service including the overhead primary lines, the associated utility poles, and

the meter shall be removed. The feeder from MDP will be connected to the well station's main 480V panelboard.

g. In the electrical room a 75KVA 480/120/208 Volt dry type transformer and a 250 Amp, 120/208 Volt, panelboard (LP1) shall be provided. The LP1 panelboard shall provide 120V and 208V power to the following loads:
   (1) Lights
   (2) Receptacles
   (3) Generator Auxiliary Systems
   (4) I/C Control Panel
   (5) Instrumentation
   (6) Chemical Feed and Transfer Pumps
   (7) Motor Operated Valves
   (8) Hot water heaters
   (9) Control Room Heat Pump System ACCU-2
   (10) Gas Fired Unit Heaters
   (11) Fire Alarm and Security Control Panels
   (12) Communication Equipment Rack

h. Variable Frequency Drives (VFDs) shall be provided for the two backwash pumps, the fume hood exhaust fan, and the makeup air unit. The VFDs shall be located in the electrical room.

i. Full voltage enclosed motor starters shall be provided for the air scour blower and shall be located in the electrical room.

j. Disconnect switches shall be provided for equipment requiring 480V power or have motors.

k. Convenient duplex receptacles shall be provided within each room and on the exterior of the building. Quad receptacles shall be provided in the control room at desk locations.

l. Electrical improvements and Well Pump Stations #3 & #4 will be confirmed in final design.

C. Lighting Systems

1. Normal Lighting

a. Vapor tight, polycarbonate housing 4' long LED light fixtures with localized light switch control shall be installed in each room.

Lighting shall provide approximately 30 to 40 foot candles of illumination in each area.

b. Exterior LED wall pack light fixtures shall be provided around the perimeter of the building and above entrance doors. The exterior lights shall be controlled by an astronomical time clock lighting switch.

2. Emergency Lighting

a. Emergency lighting battery units shall be provided in each room. Remote lighting heads shall be provided at the exterior of each exit door and will be connected into a local emergency lighting battery unit.

b. Exit signs with integral backup battery shall be provided above each exit door.

D. Fire Alarm System

1. A complete code compliant audio/visual notification addressable fire alarm system with devices located throughout the building shall be provided. A cellular digital alarm communicator transmitter (DACT) shall be provided in the system's control panel to communicate alarm events to the listed monitoring station and the monitoring station shall notify the town's fire department during a fire alarm event.

2. The fire alarm control panel shall be located in the electrical room.

3. Speaker strobes shall be located in each room except for the toilet where a strobe only visual device shall be located. An exterior strobe shall be located next to the main entry door.

4. Pull stations shall be located at each exit doors.

5. Smoke detectors shall be located in the electrical room the control room.

6. Heat detectors shall located in the Filter Area and Future PFAS Area, the chemical rooms, mechanical room, and the toilet.

7. A carbon monoxide detectors shall be located in the Filter Area and Future PFAS Future Area and the mechanical room.

E. Manual Emergency Alarm System

1. A UL listed (4) zone conventional fire alarm system shall be provided and utilized as the code required Manual Emergency Alarm System for the chemical storage rooms. The system shall be connected into the fire alarm system for remote monitoring by the fire alarm system's monitoring station.

2. The emergency alarm control panel shall be located in the electrical room.

3. Yellow colored speaker strobes shall be located within and just outside each chemical storage room.

4. Yellow colored pull stations shall be located just outside each chemical storage room.

5. Each storage room shall be wired as a separate alarm zone and act independently of one another.

F. Communication System

1. A plywood mounting backboard shall be provided in the electrical room for mounting of service provider equipment. An underground duct bank with (2) 2" conduits shall be installed from the backboard location to a nearby utility pole, if internet access is required. Fiber Optic telemetry will be provided between the water treatment plant and both well sites,

2. A wall mounted equipment rack shall be provided in the control room. The equipment rack shall contain a UPS, a CAT6 punchdown panel, an Ethernet switch, and the CCTV system DVR (see CCTV systems). A CAT6 cable from the service provided equipment to the Ethernet switch maybe be installed.

3. Two data jacks shall be provided within in the control room at each desk location. CAT6 cable from each data jack shall be installed to the equipment rack. A data jack shall be provided at the SCADA computer location to allow for remote Internet access, to be confirmed in final design.

G. CCTV System

1. A CCTV camera system with exterior cameras located on building shall be provided. A Digital Video Recorder (DVR) and camera monitoring screen shall be provided and located in the control room.

2. Exterior cameras shall IP HD color cameras that will be located to view the entire surrounding perimeter of the building.

3. The DVR shall store up to 30 days of video and shall allow remote viewing of camera images via SCADA telemetry.

H. Security System

1. Security System requirements will be confirmed in final design with the Town's security system provider.

END OF REPORT

ATTACHMENT 9

Permitting Technical Memorandum

ENVIRONMENTAL PARTNERS

TECHNICAL MEMORANDUM

Date: May 2020

To Maurice Goulet, Director of Public Works, Town of Medfield

From Eric Kelley, Project Manager, Environmental Partners

CC Paul Millett, Senior Principal, Environmental Partners
Dave Patangia, Principal, Environmental Partners
Tyler Schmidt, Project Engineer, Environment Partners

Subject Wells 3 & 4 Water Treatment Plant
Town of Medfield, Massachusetts
Permitting Technical Memorandum

The purpose of this memorandum is to summarize the permitting requirements for the proposed Wells 3 & 4 Water Treatment Plant (WTP).

FEDERAL AND STATE REGULATORY REQUIREMENTS

MASSACHUSETTS ENVIRONMENTAL PROTECTION ACT (MEPA)

The proposed WTP will require state, regional, and local regulatory review in accordance with the Massachusetts Environmental Protection Act (MEPA) (301 CMR 11.00). The project exceeds a water review threshold under MEPA, specifically 301 CMR 11.03(4)(b)4, which covers the construction of a new drinking water treatment plant with a capacity of 1 million or more gallons per day. MEPA will require the filing of an Environmental Notification Form (ENF). No estimated or priority habitats for rare or endangered species are recorded within the project limits. The ENF shall describe the project, its environmental impacts, and proposed mitigation measures. The ENF shall be submitted to the MEPA office and various state, regional, and local regulatory agencies. There is a 30 day review period, which includes 20 days for public comment, after which time the Secretary of the Executive Office of Environmental Affairs shall issue a written certificate indicating if further environmental review (Environmental Impact Report) is required. There is no fee for filing the ENF. The schedule for filing the ENF will be determined as the design progresses. A Project Notification Form (PNF) will also be submitted to the Massachusetts Historical Commission (MHC) as part of the MEPA process. Once

received, the MHC has 30 days to issue a response as to whether or not the site contains a historical resource or if additional information is required.

BRP WS 24 – APPROVAL TO CONSTRUCT A FACILITY TO TREAT 1 MILLION GALLONS PER DAY OR GREATER

The proposed WTP design requires approval from the Massachusetts Department of Environmental Protection (DEP). The proposed WTP design will be submitted to the DEP's Central Regional Office for approval under a Bureau of Resource Protection Water Supply 24 Approval to Construct a Facility to Treat One Million Gallons per Day or Greater (BRP WS 24) permit application. BRP WS 24 applications are considered Individual Rule Projects subject to the conditions of 310 CMR 4.05, which establishes that DEP will prescribe an application review timeline within 45 days after receipt of the application. The Town is exempt from paying the permit application fee. The application shall include a description of the proposed treatment facility, construction plans and specifications, chemical addition checklists, and a request for 4-log certification.

MASSACHUSETTS WETLAND PROTECTION ACT

Although the footprint of the proposed WTP is expected to lie entirely outside of the 100-foot wetland buffer, portions of several underground utilities will be installed within the buffer zone. Wetland delineation is scheduled for later in May, plans show approximated wetland based on MassGIS records. Due to work occurring within the buffer zone, a Request for Determination of Applicability (RDA) shall be filled with the Medfield Conservation Commission and the DEP Central Regional Office. The Commission will determine if a Notice of Intent (NOI) is required thereafter. The review period for the NOI is two weeks prior to the public hearing. The Medfield Conservation Commission holds meetings on the first and third Thursday of the month.

CONSTRUCTION STORMWATER GENERAL PERMIT

The National Pollutant Discharge Elimination System (NPDES) requires that construction projects disturbing more than 1 acre of land prepare a NOI to the Environmental Protection Agency (EPA). In addition to the NOI, a stormwater pollution prevention plan (SWPPP) must be developed and implemented. Currently, the proposed project disturbed area is approximately 1.2 acres.

EMERGENCY PLANNING AND COMMUNITY RIGHT-TO-KNOW ACT (EPCRA)

In accordance with EPRCA regulations, the Town must notify various State and local agencies of the on-site storage and use of potassium hydroxide, sodium hypochlorite, and sodium bisulfite. State agencies include: State Fire Marshal, Massachusetts Emergency Management Administration, and State Emergency Response Commission. Local agencies include: Fire Department, Board of Health, and Civil Defense/Emergency Management.

100 YEAR FLOODPLAIN

According to the Flood Insurance Rate Maps (FIRMs), the area surrounding Well 4 is located in a flood zone (Zone A – 100-Year Flood Zone with Base Flood Elevation not determined). Proposed work near Well 4 includes underground utility work and repaving. Excavation is listed as an activity that requires a development permit under the National Flood Insurance Program (NFIP). However, it is exempt from the list of typical activities requiring a permit according to the Federal Emergency Management Agency (FEMA) permit checklist. Due to this conflict and at the recommendation of the project checklist, a pre-application meeting will be conducted with the local code official to determine permit applicability to the project.

LOCAL REGULATORY REQUIREMENTS

LOCAL BUILDING PERMITS

The proposed WTP will include building, plumbing, gas-fitting, electrical, fire safety, and HVAC work that will require approval from the Town of Medfield Building Department. The Fire Marshall will be contacted for initial conversations, and the requirements to provide sprinkler and fire protection requirements will be confirmed. The specific building department permits and fees will be confirmed during the next phase of design. The WTP general contractor will be required to obtain the necessary building permits prior to the start of construction.

SITE PLAN REVIEW

The proposed WTP is subject to site plan approval through the Town of Medfield Planning Board. Based on a preliminary review of the Town of Medfield zoning bylaw, a special permit will be required for a municipal use building in a residential estate zone. Additionally, waivers will be required for proposed work within the well protection district. The Site Plan Application, including site plans; Development Impact Report; and Stormwater Management Plan and Report will be submitted in compliance with the Town of Medfield Zoning By-Law. The Development Impact Report may be waived for this project. The following Town departments will have 30 days for review and comment: Building, Public Works, Board of Health, Conservation Commission, Fire, Police, and Engineering. A public hearing will be scheduled within 45 days of receipt of the application; and the Planning Board will issue a final decision within 30 days of the close of the public hearing.

ADDITIONAL DESIGN CONSIDERATIONS

Additional items to consider for the next phase of design include:

- Coordination with the Medfield Tree Warden regarding site clearing.

ATTACHMENT 10

Opinion of Probable Construction Costs

MEDFIELD WELLS 3&4
AND WATER TREATMENT PLANT
TOWN OF MEDFIELD
MASSACHUSETTS

SCHEMATIC DESIGN ESTIMATE OF PROBABLE CONSTRUCTION COSTS

Prepared For:

ENVIRONMENTAL PARTNERS GROUP
1900 Crown Colony Drive, Suite 402
Quincy, MA 02169

Prepared By:

COSTPRO, INC.

10 Post Office Square, 8th Floor South
Boston, MA 02109
☏ (617) 692-2924

May 27, 2020

TABLE OF CONTENTS

GENERAL NOTES

1.1 The following estimate does not include the cost of furniture, furnishings or portable equipment unless specifically itemized. The estimate does not include land costs, financing costs, professional fees or litigation costs unless specifically itemized

1.2 No overtime working is included in the estimates except where specifically itemized. All other work is assumed to be performed during the contractors' normal working hours.

1.3 The unit prices used in this estimate are specifically developed for this project and should only be used for this project. Unit prices used in one part of this estimate may not be interchangeable with those in other sections of this estimate. Prices are based on specific conditions and ratios which are unique to that part of the estimate for which they were developed. Use of these prices on other projects could result in substantial errors being made.

1.4 The unit prices used in this estimate are developed from prevailing wage rates and productivities and should not be used under any circumstances for estimates of general contractors' or sub-contractors' costs where such wage rates are not applicable.

1.5 Evaluations of the owner's project budget, preliminary estimates of construction cost and detailed estimates of construction cost, if any, prepared for this part of the project, represent CostPro, Inc.'s best judgment as a professional familiar with the construction industry. It must be recognized, however, that CostPro, Inc. has no control over the costs of labor, materials or equipment, over the contractor's methods of determining bid prices, or over competitive bidding, market or negotiating conditions. Accordingly, CostPro, Inc. cannot and does not warrant or represent that bids or negotiated prices for any part of the project will not vary from the owner's project budget or from any estimate of construction cost or evaluation prepared or agreed to by CostPro, Inc.

SPECIFIC NOTES

1. This estimate was prepared from Schematic Design documents dated May 20, 2020 provided by Environmental Partners Group. CostPro, Inc. relied upon the adequacy of the contents of these documents in preparing this estimate of construction costs. All responsibility for the adequacy of any program or design must remain with the Architect or Engineer who prepared it.

2. This estimate is based upon procurement of a construction contract with a competitive bid process with at least six responsive bidders. For less than six bidders add 5% to the costs shown for each bidder fewer than six. For example, add 10% for only 4 responsive bids in the event of an overbid.

4. This estimate is priced at the 95% risk analysis confidence level. Essentially this means that 95% of all projects this size priced at these unit prices will bid below the cost estimate and 5% will bid above the cost estimate. At the 95% confidence level there is a small chance of substantial cost overruns and a good chance that winning bids will come in below the cost estimate. Winning bids in the range of 5% below to 15% above the estimate are possible, but the most probable (target) result is a winning bid that falls 2.5% below the cost estimate.

5. Escalation to bid date is included as noted in the estimate detail.

6. All unit prices shown in the estimate are present day prices prevailing in the Medfield, Massachusetts area.

7. The gross area of the tanks beneath the building is not included in the gross area calculation. The gross area of the well stations is not included in the gross area calculation. An area of 6,027 sf was measured. This area has no cost impact; it is simply used to calculate system square foot costs.

8. The estimate is based on design completion and a bid date of March 15, 2021.

9. A design and price reserve of 15% is included as a line item at summary level. This covers detail added during design completion and normal marketplace fluctuations. It is not intended to cover major design changes or wild swings in the marketplace.

10. Construction Cost Consultant:

CostPro, Inc.
10 Post Office Square, 8th Floor South
Boston, MA 02109
☏ (617) 692-2924

PROJECT: WELLS 3 & 4 WATER TREATMENT PLANT
TOWN OF MEDFIELD
MEDFIELD, MASSACHUSETTS GAA 6,027 SF

COSTPRO, INC.

Code	Item Description			Quantity	Unit Price	Total
	GENERAL SUMMARY					$
1.000000	GENERAL REQUIREMENTS (SEE BELOW)		0.0%	$0.00	/SF	0
2.000000	SITE CONSTRUCTION		14.8%	$170.42	/SF	1,027,136
3.000000	CONCRETE		10.8%	$124.90	/SF	752,793
4.000000	MASONRY		1.8%	$20.36	/SF	122,722
5.000000	METALS		0.5%	$6.34	/SF	38,202
6.000000	WOOD & PLASTIC		0.4%	$4.15	/SF	25,028
7.000000	THERMAL & MOISTURE PROTECTION		1.5%	$17.26	/SF	104,017
8.000000	DOORS & WINDOWS		1.3%	$15.12	/SF	91,130
9.000000	FINISHES		1.4%	$15.79	/SF	95,168
10.000000	SPECIALTIES		0.1%	$0.70	/SF	4,230
11.000000	EQUIPMENT		32.2%	$372.21	/SF	2,243,324
12.000000	FURNISHINGS		0.5%	$5.98	/SF	36,066
13.000000	SPECIAL CONSTRUCTION		9.8%	$113.19	/SF	682,175
14.000000	CONVEYING SYSTEMS		0.0%	$0.00	/SF	0
15.000000	MECHANICAL		8.2%	$94.16	/SF	567,525
16.000000	ELECTRICAL		16.8%	$193.69	/SF	1,167,382
		Subtotal		$1,154.29	/SF	$6,956,898
1.100000	GENERAL REQUIREMENTS				8.50%	591,336
		Subtotal		$1,252.40	/SF	7,548,234
1.200000	OVERHEAD & PROFIT				10.00%	754,823
		Subtotal		$1,377.64	/SF	8,303,057
1.300000	ESCALATION TO BID DATE	3/15/2021			4.42%	366,995
				$1,438.54	/SF	8,670,052
1.400000	ESCALATION TO MID POINT	9/12/2021			2.37%	205,480
		Subtotal		$1,472.63	/SF	8,875,532
1.600000	BOND				1.34%	118,932
		Subtotal		$1,492.36	/SF	8,994,464
1.700000	DESIGN & PRICE RESERVE				15.00%	1,349,170
		TOTAL COST		$1,716.22	/SF	$10,343,634

Code	Item Description		Quantity	Unit	Price	Total
2.000000	SITE CONSTRUCTION					$
2.020000	EROSION & SEDIMENT CONTROL					
2.020001	6" crushed stone	constn entrance	600	sf	0.88	528
2.020002	filter fabric	constn entrance	600	sf	1.31	786
2.020005	erosion control	filter sock	200	lf	7.20	1,440
2.060000	SITE CLEARING					
2.060001	clearing trees		1.44	acre	18,654.17	26,862
2.060002	grubbing trees		1.44	acre	9,001.72	12,962
2.060003	strip & stockpile topsoil		1,163	cy	4.66	5,420
2.100000	SITE REMEDIATION					
2.115001	asbestos abatement	well 3 building	272	sf	32.54	8,851
2.115002	asbestos abatement	well 4 building	272	sf	32.54	8,851
2.115003	demolish & dispose mercury float switches		2	ea	343.94	688
2.100000	SITE PREPARATION					
	selective demolition well 3 building					
2.101056	sawcut 12" cmu wall for new louver	30"30"	10	lf	64.16	642
2.101057	remove 12" cmu wall		6	sf	6.44	39
2.101058	remove roofing & insulation	bui1t-up	440	sf	3.89	1,712
2.101059	remove flashings & blocking		102	lf	6.76	690
	selective demolition well 4 building					
2.101060	sawcut 12" cmu wall for new louver	30"30"	10	lf	64.16	642
2.101061	remove 12" cmu wall		6	sf	6.44	39
2.101062	remove roofing & insulation	bui1t-up	440	sf	3.89	1,712
2.101063	remove flashings & blocking		102	lf	6.76	690
	process demolition at well 3 & 4					
2.101065	well station demolitions including chemical feed systems		80	hrs	106.23	8,498
2.101068	demolish 6" DI piping & fittings		6	lf	20.99	126
2.101069	cut & cap 8" DI pipe		2	ea	661.57	1,323
2.101070	disconnect 8" DI pipe		1	ea	200.64	201
2.101071	demolish hydrant		1	ea	786.29	786
2.101088	demolish well pumps	75hp	2	ea	3,958.59	7,917
	electrical demolition well 3 building					
2.101130	remove overhead service	450 lf	16	crew hrs	264.81	4,237
2.101131	remove utility poles		3	ea	594.33	1,783
2.101132	remove meter		1	ea	363.32	363
2.101133	remove generator set, hand to owner		1	ea	3,821.94	3,822
2.101133	remove propane tank & piping		1	ea	2,712.72	2,713
	electrical demolition well 4 building					
2.101134	remove overhead service	430 lf	16	hrs	264.81	4,237
2.101135	remove utility poles		3	ea	594.33	1,783
2.101136	remove meter		1	ea	363.32	363
	disposal of demolished materials					
2.101138	dumpster rental		5	weeks	695.57	3,478
2.101139	load & truck	10 mile round trip	100	cy	77.68	7,768
2.101140	dump charges		40	ton	90.15	3,606

Code	Item Description		Quantity	Unit	Price	Total
2.200000	EARTHWORK					
2.211000	mobilization		1	ls	4,451.65	4,452
2.211001	demobilization		1	ls	4,451.65	4,452
2.211002	cut	site material	1,770	cy	7.28	12,886
2.211003	fill	site material	2,608	cy	7.28	18,986
2.211005	rough grade site		56,752	sf	0.18	10,215
2.211006	fine grade	roads & walks	15,296	sf	0.50	7,648
2.211007	fine grade	pads	812	sf	0.54	438
2.211008	excavation for roadways		755	cy	8.13	6,138
2.211009	excavation for bioretention basins		356	cy	7.28	2,592
2.211014	gravel in bioretention basins		153	cy	37.03	5,666
2.211021	rough grade	building pad	6,027	sf	0.27	1,627
2.211022	fine grade	building pad	6,027	sf	0.54	3,255
2.211023	trenching for gas lines		88	lf	26.05	2,292
2.211024	trenching, bedding & backfill for 2"water service		132	lf	26.05	3,439
2.211026	trenching, bedding & backfill for 6"water service		143	lf	26.05	3,725
2.211027	trenching, bedding & backfill for 8"water service		580	lf	26.05	15,109
2.211028	trenching, bedding & backfill for 12"water service		270	lf	26.05	7,034
2.211029	trenching for duct bank		2,380	lf	20.79	49,480
2.211033	excavate drywell/yard hydrant		4	cy	34.72	139
2.211034	compacted backfill around yard hydrant		3	cy	70.24	211
2.211035	excavation for structures	storage tank	274	cy	34.72	9,513
2.211036	excavation for structures	tight tank	66	cy	34.72	2,292
2.211040	excavation for foundations		112	cy	27.73	3,106
2.211043	excavation for structures		340	cy	34.72	11,805
2.211044	compacted granular fill under structures	building pad	223	cy	64.11	14,297
2.211045	compacted granular fill under structures	tight tank	5	cy	64.11	321
2.211046	compacted backfill around structures & tanks		139	cy	70.24	9,763
2.211047	trim excavation to slopes	backwash tank	753	sf	2.20	1,657
2.211048	shoring		1,117	sf	16.26	18,162
2.211049	hauling & disposal	off site	927	cy	22.23	20,607
2.211052	rip rap in bioretention basin overflows		544	sf	7.96	4,330
2.211054	dewatering	allow	1	ls	5,422.72	5,423
2.444000	CHAIN LINK FENCE					
2.444007	9"6" fence, chain link industrial lean-in top	security	900	lf	72.27	65,043
2.444008	30'0" manual slide gate, chain link industrial	security	1	ea	11,062.35	11,062
2.513000	BITUMINOUS CONCRETE PAVING					
2.513004	gravel building surround		1,341	sf	1.10	1,475
2.513006	12" compacted gravel base course		15,296	sf	1.29	19,732
2.513009	2 1/2"asphaltic concrete binder course		15,296	sf	1.42	21,720
2.513010	1 1/2"asphaltic concrete wearing course		15,296	sf	0.97	14,837
2.513012	prime coat		15,296	sf	0.38	5,812
2.513013	tack coat		15,296	sf	0.20	3,059
2.513014	sealcoating		15,296	sf	0.38	5,812
2.513016	bituminous berm		326	lf	10.70	3,488

Code	Item Description		Quantity	Unit Price	Total
2.570000	SANITARY SEWERS				
	sanitary waste				
2.570007	4" pvc gravity sewer		38 lf	43.38	1,648
2.570010	tight tank, precast concrete underground	8000 gallon	1 ea	19,087.99	19,088
2.570011	access manhole & cover		1 ea	3,922.01	3,922
	process waste				
2.570012	4" HDPE sewer force main	backwash waste	314 lf	67.78	21,283
2.570013	4" connection to extension by town		1 ea	542.27	542
2.600000	WATER UTILITIES				
	domestic water				
2.600001	2" copper type K service line		132 lf	52.98	6,993
2.600002	2"service box & curb stop		1 ea	708.21	708
	groundwater sources				
2.600006	new well 3a		1 ea	100,000.00	100,000
2.600007	redevelop well 4		1 ea	25,000.00	25,000
	raw water				
2.600008	12" DI pipe		122 lf	144.24	17,597
2.600009	12" gate valve & box		1 ea	7,618.93	7,619
2.600010	12" DI bend	90 degree	1 ea	1,437.02	1,437
2.600011	12x8" DI tee		2 ea	2,955.38	5,911
2.600012	8" DI pipe		572 lf	92.73	53,042
2.600013	8" gate valve & box		7 ea	4,256.84	29,798
2.600017	8" DI bend	90 degree	3 ea	818.83	2,456
2.600018	8x8" DI tee		2 ea	1,437.02	2,874
2.600021	8" connection to existing water main		3 ea	1,762.38	5,287
2.600022	flushing hydrant assembly		1 ea	3,687.45	3,687
2.600023	thrust blocks	see division 3.3	20 ea	0.00	0
	finished water				
2.600024	12" DI pipe		148 lf	144.24	21,348
2.600025	12" gate valve & box		4 ea	7,618.93	30,476
2.600026	12" DI bend	90 degree	1 ea	1,437.02	1,437
2.600027	12" DI tee		1 ea	2,955.38	2,955
2.600028	12x8" DI tee		2 ea	2,955.38	5,911
2.600029	12" connection to existing water main		2 ea	2,711.36	5,423
2.600030	8" DI pipe		8 lf	92.73	742
2.600031	8" gate valve & box		1 ea	4,256.84	4,257
2.600032	8" DI bend	90 degree	1 ea	818.83	819
2.600038	flushing hydrant assembly		1 ea	3,687.45	3,687
2.600039	thrust blocks	see division 3.3	13 ea	0.00	0
	fire service				
2.600051	6" DI pipe		143 lf	75.92	10,857
2.600052	6" gate valve & box		1 ea	3,524.77	3,525
2.600056	6" DI bend	90 degree	3 ea	110.62	332
2.600058	thrust blocks	see division 3.3	4 ea	0.00	0

Code	Item Description		Quantity	Unit Price	Total
2.700000	NATURAL GAS				
	propane				
2.700002	propane tank, above ground	2000 gallon	1 ea	16,159.71	16,160
2.700003	propane gas vaporizer	1810 cfh	1 ea	8,730.58	8,731
2.700004	1 1/2" gas pipe to generator		27 lf	25.32	684
2.700005	1 1/2" gas pipe to building		61 lf	25.32	1,545
2.700011	regulators		2 ea	1,280.00	2,560
2.800000	SITE IMPROVEMENTS				
2.800030	6x10 concrete wheelstop		5 ea	91.64	458
2.800031	paint parking stall	small job	6 ea	26.57	159
2.800032	paint parking stall	h/capped	1 ea	96.52	97
2.800033	pavement marking	gore lines	160 sf	2.47	395
2.800034	signs	h/capped	1 ea	330.79	331
2.900000	LANDSCAPING				
2.900002	amend & spread topsoil from stockpile		1,163 cy	7.30	8,490
2.900004	planting soil in bioretention basins	36"	459 cy	59.25	27,196
2.900005	seed		34,629 sf	0.16	5,541
2.900006	bioretention ponds	planting	4,130 sf	3.26	13,464
2.900007	mulch in bioretention basins	4"	51 cy	39.34	2,006
2.000000	SITE WORK	TOTAL COST	$170.42 /SF		$1,027,136

Code	Item Description		Quantity	Unit	Unit Price	Total
3.000000	CONCRETE					$
3.300000	CAST-IN-PLACE CONCRETE					
	including forms, rebar & concrete					
3.300023	24"x12" cotinuous footing, forms & rebar		17	cy	838.67	14,257
3.300024	isolated footings, forms & rebar		8	cy	838.67	6,709
3.300031	entrance pad on grade, forms & rebar		50	sf	11.75	588
3.300032	entrance pad edge thicknessing, forms & rebar		30	lf	46.59	1,398
3.300033	12" concrete mat on grade, forms & rebar	building pad	3,837	sf	37.26	142,967
3.300035	18" concrete mat on grade, forms & rebar	containment	869	sf	55.89	48,568
3.300036	24" concrete mat on grade, forms & rebar	backwash tank	1,346	sf	74.53	100,317
3.300038	extra for sloped slab	backwash tank	753	sf	6.11	4,601
3.300042	12" suspended concrete slab, forms & rebar		1,321	sf	49.59	65,508
3.300047	form 36x36" opening		4	ea	529.15	2,117
3.300057	12" concrete walls below grade, forms & rebar	foundations	961	sf	52.54	50,491
3.300060	18" concrete walls below grade, forms & rebar	containment	203	sf	78.81	15,998
3.300061	18" concrete walls below grade, forms & rebar	backwash tank	2,182	sf	78.81	171,963
3.300064	attached piers concrete, forms & rebar		2	cy	2,760.68	5,521
3.300069	8x8" concrete curb, forms & rebar	exterior wall	159	lf	66.19	10,524
3.300070	12x8" concrete curb, forms & rebar	exterior wall	140	lf	83.70	11,718
3.300071	8x8" concrete curb, forms & rebar	partitions	198	lf	66.19	13,106
3.300073	8" concrete walls, forms & rebar	containment	140	sf	41.49	5,809
3.300076	3/4" chamfer		159	lf	5.97	949
3.300077	concrete pipe encasement, forms & rebar	12" pipe	4	lf	262.63	1,051
3.300078	equipment pads	propane tank	296	sf	48.27	14,288
3.300079	equipment pads	transformer	64	sf	19.31	1,236
3.300080	equipment pads	HVAC	48	sf	19.31	927
3.300081	equipment pads	generator	356	sf	38.62	13,749
3.300082	equipment pads	chemical fill	48	sf	19.31	927
3.300083	bollard footing	24" diam x 5'0"	18	ea	330.50	5,949
3.300084	fence post footing	allow	113	ea	45.56	5,148
3.300086	concrete thrust block	15"x15"x15"	37	ea	277.66	10,273
3.400000	PRECAST CONCRETE					
3.410000	8" precast hollow core plank	mezzanine	1,929	sf	12.77	24,633
3.000000	CONCRETE	TOTAL COST	$124.90	/SF		$752,793

Code	Item Description		Quantity	Unit Price	Total
4.000000	MASONRY				$
4.200000	UNIT MASONRY				
4.220000	CONCRETE UNIT MASONRY				
	well 3 building				
4.221605	cut new lintel into 12" exterior wall		5 lf	253.76	1,269
	well 4 building				
4.221606	cut new lintel into 12" exterior wall		5 lf	253.76	1,269
4.810000	UNIT MASONRY				
4.810001	4" cmu back-up wall, #5@32" cc, grouted solid		50 sf	23.64	1,182
4.810002	8" cmu back-up wall, #5@32" cc, grouted solid		1,413 sf	27.99	39,550
4.810003	8" cmu partition, #5@32" cc, grouted solid		2,318 sf	27.99	64,881
4.810003	8" cmu lintel, 16" 2#6 bars		73 lf	49.40	3,606
4.810008	scaffolding		3,781 sf	2.90	10,965
4.000000	MASONRY	TOTAL COST	$20.36 /SF		$122,722

PROJECT: WELLS 3 & 4 WATER TREATMENT PLANT
TOWN OF MEDFIELD
MEDFIELD, MASSACHUSETTS GAA 6,027 SF

COSTPRO, INC.

Code	Item Description		Quantity	Unit	Price	Total
5.000000	METAL MATERIALS, FINISHES AND FASTENINGS					$
5.500000	METAL FABRICATIONS					
	misc. metals					
5.510418	ladder w/cage	aluminum	20	vlf	241.72	4,834
5.510419	ladders	stainless steel	43	vlf	233.77	10,052
5.510422	bollards 6" galv conc. filled		18	ea	890.55	16,030
5.510423	bollard pipe sleeve 42"		18	ea	404.79	7,286
5.000000	METAL MATERIALS	TOTAL COST	$6.34	/SF		$38,202

Code	Item Description		Quantity	Unit	Price	Total
6.000000	WOOD & PLASTICS					$
6.105000	ROUGH CARPENTRY					
6.110000	WOOD FRAMING					
6.110200	pressure treated blocking *well 3 building*	allowance	0.25	mbf	8,284.70	2,071
6.110230	pressure treated blocking *well 4 building*		0.31	mbf	8,284.70	2,568
6.110231	pressure treated blocking		0.31	mbf	8,284.70	2,568
6.200000	FINISH CARPENTRY					
6.220000	MILLWORK MOLDINGS					
6.220806	moldings, window and door	trim set & stool	4	windows	258.08	1,032
6.820000	FIBERGLASS GRATING, STAIRS, PLATFORMS & RAILINGS					
6.820001	11" I5015 pultruded FRP platform FRP steps		66	lfr	39.70	2,620
6.820002	1 1/2" I5015 pultruded FRP platform grating		88	sf	35.73	3,144
6.820003	FRP edge angle, drilled & anchored		42	lf	72.79	3,057
6.820004	FRP guardrail w/4" kick plate		17	lf	62.73	1,066
6.820005	FRP guardrail/handrail		27	lf	86.03	2,323
6.820006	FRP post base plate	unsized	4	ea	33.09	132
6.820007	base plate anchor bolts	unsized	16	ea	26.13	418
6.820008	4"x4" FRP platform support posts	unsized	12	lf	52.94	635
6.820009	8" FRP platform framing	unsized	36	lf	39.70	1,429
6.820010	12" FRP channel stringers	unsized	27	lf	72.79	1,965
6.000000	WOOD & PLASTICS	TOTAL COST	$4.15	/SF		$25,028

Code	Item Description		Quantity	Unit Price	Total
7.000000	MOISTURE-THERMAL CONTROL				$
7.115000	WATERPROOFING AND DAMPPROOFING				
7.110000	DAMPRPROOFING				
7.110001	self adhered sheet membrane waterproofing	foundation walls	3,346 sf	5.50	18,403
7.110002	molded sheet drainage panel system	foundation walls	3,346 sf	1.70	5,688
7.192000	VAPOR RETARDERS				
7.192200	vapor retarder		6,052 sf	0.34	2,058
7.210000	BUILDING INSULATION				
	well 3 building				
7.210008	5-8.5" polyiso tapered roof deck insulation	roofs	440 sf	8.34	3,670
	well 4 building				
7.210009	5-8.5" polyiso tapered roof deck insulation	roofs	440 sf	8.34	3,670
7.213000	FOUNDATION INSULATION				
7.213002	2" polystyrene wall insulation, rigid	slabs on grade	6,052 sf	3.19	19,306
7.213003	2" polystyrene wall insulation, rigid	foundation walls	3,346 sf	4.07	13,618
7.500000	MEMBRANE ROOFING				
	well 3 building				
7.510105	single-ply membrane	60 mils epdm	440 sf	10.75	4,730
	well 4 building				
7.510106	single-ply membrane	60 mils epdm	440 sf	10.75	4,730
7.600000	FLASHING AND SHEET METAL				
	well 3 building				
7.610002	self adhered membrane flashing		102 lf	5.50	561
	well 4 building				
7.610003	self adhered membrane flashing		102 lf	5.50	561
7.620000	SHEET METAL FLASH & TRIM				
7.620003	stainless steel flat seam insulation flashing	foundation	319 lf	9.83	3,136
7.620003	through wall flashings		167 lf	12.26	2,047
	well 3 building				
7.620008	through wall flashings		10 lf	12.26	123
	well 4 building				
7.620009	through wall flashings		10 lf	12.26	123
7.700000	ROOF SPECIALTIES AND ACCESSORIES				
7.700008	snow guards	3 rail	199 lf	86.53	17,219

Code	Item Description		Quantity	Unit Price	Total
	well 3 building				
7.700009	fascia/edge trim		86 lf	13.32	1,146
	well 4 building				
7.700010	fascia/edge trim		86 lf	13.32	1,146
7.920000	JOINT SEALERS				
7.920002	1/2" backer rod & sealant		334 lf	5.88	1,964
	well 3 building				
7.920003	1/2" backer rod & sealant		10 lf	5.88	59
	well 4 building				
7.920004	1/2" backer rod & sealant		10 lf	5.88	59
7.000000	MOISTURE-THERMAL CONTROL	TOTAL COST	$17.26 /SF		$104,017

Code	Item Description		Quantity	Unit Price	Total
8.000000	DOORS, WINDOWS AND GLASS				$
8.100000	METAL DOORS AND FRAMES				
8.120000	HOLLOW METAL FRAMES				
8.120004	h.m. door frame	3'4x7'2	4 ea	408.05	1,632
8.120005	h.m. door frame	6'8x7'2	3 ea	508.58	1,526
8.120007	h.m. window frame	6'0x3'0	3 ea	457.72	1,373
8.161000	FRP FLUSH DOORS				
8.111813	hybrid FRP/aluminum door	3'0x7'0	10 ea	798.35	7,984
8.331000	OVERHEAD COILING DOORS				
8.305405	coiling door, insulated steel motorized	12'0x12'0	1 ea	7,007.75	7,008
8.400000	ENTRANCES AND STOREFRONTS				
8.410000	aluminum storefront entrance frame	3'3"x7'2 1/2"	1 ea	1,182.74	1,183
8.410001	aluminum storefront entrance frame	4'8"x7'2 1/2"	1 ea	1,376.24	1,376
8.410006	hybrid FRP/aluminum door, insulated w/vision par	3'0x7'0	2 ea	798.35	1,597
8.560000	WOOD AND PLASTIC WINDOWS				
8.561000	VINYL WINDOWS				
8.561001	3'4 x 3'0" fixed vinyl windows at fill stations		3 ea	768.01	2,304
8.561001	4'0 x 3'0" fixed vinyl windows at control room		1 ea	922.54	923
8.710000	DOOR HARDWARE				
8.710001	finish hardware exterior door w/panic device		2 leaf	2,581.18	5,162
8.710002	finish hardware interior door		10 leaf	1,033.55	10,336
8.710003	aluminum threshold		8 lf	52.24	418
8.720000	OPERATORS				
8.720002	automatic operators	coiling doors	1 ea	1,892.39	1,892
8.800000	GLAZING				
8.810000	1" tempered insulating glass in doors and sidelites		12 sf	63.28	759
8.810001	1" tempered glass in hollow metal windows and transomes		54 sf	63.28	3,417
8.900000	LOUVERS AND VENTS				
8.900001	louver	24"x24"	2 ea	266.92	534
8.900002	louver	36"x36"	1 ea	497.45	497
8.900003	louver	50"x36"	1 ea	758.31	758

Code	Item Description		Quantity	Unit Price	Total
	well 3 building				
8.900006	louver	30"x30"	1 ea	509.58	510
	well 4 building				
8.900007	louver	30"x30"	1 ea	509.58	510
8.950000	FIBERGLASS SANDWICH PANELS				
8.950001	kalwall panels for daylighting	8'0x4'0"	128 sf	30.02	3,843
8.810003	fiberglass sandwich panel assembly	12'0"x22'0"	792 sf	30.02	23,776
8.000000	DOORS, WINDOWS AND GLASS	TOTAL COST	$15.12 /SF		$91,130

Code	Item Description		Quantity	Unit Price	Total
9.000000	FINISHES				$
9.510000	ACOUSTICAL CEILINGS				
9.510202	suspended ceilings, complete	2x2 moisture res.	293 sf	10.69	3,132
9.653000	RESILIENT BASE				
9.653001	6"vinyl base		104 lf	4.93	513
9.600000	FLOORING AND CARPET				
9.615108	work pads/mats at control room	allowance	293 sf	12.59	3,689
9.900000	PAINTING AND COATINGS				
9.920000	INTERIOR PAINTING				
9.920404	paint new h.m. door & window frames		242 lf	4.41	1,067
9.920405	concrete floor sealer		6,027 sf	0.83	5,002
9.920409	prep. & paint cmu walls		6,099 sf	2.06	12,564
9.920410	prep. & paint process piping		720 lf	6.22	4,478
9.920411	prep. & paint valves & fittings		157 ea	32.74	5,140
9.920412	prep. & paint pressure filters		4 ea	805.84	3,223
9.920413	prep. & paint vertical turbine pump		2 ea	98.21	196
9.920419	prep. & paint precast plank soffit		1,929 sf	2.25	4,340
9.920420	prep. & paint containment areas *well 3 building*		1,499 sf	30.09	45,105
9.920422	prep. & paint existing building *well 4 building*		272 sf	10.01	2,723
9.920423	prep. & paint existing building		272 sf	10.01	2,723
9.960000	SPECIAL COATINGS				
9.965600	EPOXY COATINGS				
9.965602	high build epoxy 50 mil, solvent based	conc. floor	368 sf	3.46	1,273
9.000000	FINISHES	TOTAL COST	$15.79 /SF		$95,168

PROJECT: WELLS 3 & 4 WATER TREATMENT PLANT
TOWN OF MEDFIELD
MEDFIELD, MASSACHUSETTS GAA 6,027 SF

COSTPRO, INC.

Code	Item Description		Quantity	Unit Price	Total
10.000000	SPECIALTIES				$
10.140000	SIGNAGE				
10.410401	bulletin board	allow	1 ea	300.13	300
10.410403	signs	allow	9 ea	72.48	652
10.440000	FIRE PROTECTION SPECIALTIES				
10.440001	fire extinguishers, 30lb dry chemical	allow	5 ea	543.63	2,718
10.800000	TOILET AND BATH ACCESSORIES				
10.800001	32" grab bar		1 ea	74.75	75
10.800002	42" grab bar		1 ea	85.51	86
10.800003	double roll toilet tissue dispenser		1 ea	58.89	59
10.800004	soap dispenser	surface mtd	1 ea	100.80	101
10.800005	paper towel dispenser	surface mtd	1 ea	100.80	101
10.800006	mop strip		1 ea	138.17	138
10.000000	SPECIALTIES	TOTAL COST	$0.70 /SF		$4,230

Code	Item Description		Quantity	Unit Price	Total
11.000000	EQUIPMENT				$
11.200000	PROCESS PIPING AND VALVES				
	process equipment				
11.200001	process mechanical equipment	see EPG list	1 ls	1,136,880.18	1,136,880
11.200009	coordinate delivery, handle & store equipment		5%		56,844
11.200010	intall equipment		20%		227,376
11.200011	equipment subcontractor overhead & profit	by G.C.	0%		0
11.200012	process piping & valves; equipment hookups & rigging		35%		397,908
	chemical feed & storage				
11.200013	chemical fill station		3 ea	4,853.17	14,560
11.200014	chemical feed piping	pvc	714 sf	61.23	43,718
	raw water				
11.200101	12" DI pipe		9 lf	161.37	1,452
11.200104	12" DI bend	90 degree	2 ea	1,607.61	3,215
11.200105	12x8" DI reducer		2 ea	1,128.36	2,257
11.200109	8" DI pipe		8 lf	103.74	830
	oxidized water				
11.200130	12" DI pipe		151 lf	161.37	24,367
11.200131	12x4" Tee		4 ea	3,306.22	13,225
11.200134	12" DI bend	90 degree	5 ea	1,607.61	8,038
11.200138	12" butterfly valve	BFV	1 ea	2,547.92	2,548
11.200139	air relief valve		1 ea	454.99	455
	filter influent				
11.200155	6" DI pipe		6 lf	84.93	510
11.200156	6x4" Tee		4 ea	1,116.23	4,465
11.200158	6" DI bend	45degree	4 ea	576.31	2,305
11.200161	4" DI pipe		32 lf	69.76	2,232
11.200166	4" motorized check valve	see EPG list	4 ea	0.00	0
11.200167	4" butterfly valve	BFV	4 ea	1,128.36	4,513
11.200169	air relief valve		4 ea	454.99	1,820
	backwash waste				
11.200174	8" DI pipe		72 lf	103.74	7,469
11.200177	8x6" reducer		1 ea	740.11	740
11.200178	8x8" Tee		1 ea	1,607.61	1,608
11.200179	8" DI bend	90 degree	4 ea	916.04	3,664
11.200187	8" swing check valve with control wheel	CV	2 ea	4,155.53	8,311
11.200189	6" DI pipe		88 lf	84.93	7,474
11.200190	6" Tee		4 ea	1,116.23	4,465
11.200191	6x4" Tee		4 ea	1,116.23	4,465
11.200192	6" DI bend	90 degree	4 ea	576.31	2,305
11.200196	6" motorized check valve	see EPG list	4 ea	0.00	0
11.200197	4" DI pipe		44 lf	69.76	3,069
11.200199	4" DI bend	90 degree	5 ea	424.65	2,123
11.200202	4" swing check valve	CV	2 ea	1,395.29	2,791
11.200203	4" gate valve	WSV	2 ea	1,425.62	2,851
11.200204	4"butterfly valve	BFV	4 ea	1,128.36	4,513
11.200206	4" emergency truck hook-up		1 ea	1,819.94	1,820
	emergency backwash				
11.200211	8" DI pipe		8 lf	103.74	830
11.200216	8" DI bend	90 degree	1 ea	916.04	916
11.200222	8" motorized gate valve	FV	1 ea	5,156.50	5,157
11.200223	8" butterfly valve	BFV	1 ea	1,577.28	1,577

Code	Item Description		Quantity	Unit Price	Total
11.200225	8" gate valve	PSV	1 ea	3,063.57	3,064
	draindown				
11.200240	4" DI pipe		32 lf	69.76	2,232
11.200242	4" motorized gate valve	see EPG list	4 ea	0.00	0
	filter intake				
11.200259	6" DI pipe		32 lf	84.93	2,718
11.200260	6" DI bend		4 ea	576.31	2,305
11.200266	6" motorized gate valve	see EPG list	4 ea	0.00	0
	filter effluent				
11.200289	6" DI pipe		64 lf	84.93	5,436
11.200290	6" Tee		4 ea	1,116.23	4,465
11.200291	6" DI bend		12 ea	576.31	6,916
11.200297	6" motorized gate valve	see EPG list	8 ea	0.00	0
11.200298	6" butterfly valve	BFV	4 ea	1,352.82	5,411
	filtered water				
11.200315	12" DI pipe		72 lf	161.37	11,619
11.200317	12x6" Tee		4 ea	3,306.22	13,225
11.200318	12x8" Tee		2 ea	3,306.22	6,612
11.200320	12" DI bend	90 degree	2 ea	1,607.61	3,215
11.200324	12" motorized gate valve	FV	2 ea	8,917.71	17,835
11.200325	12" motorized butterfly valve	BFV	1 ea	4,640.85	4,641
11.200326	12" swing check valve	CV	1 ea	8,371.72	8,372
11.200327	air relief valve		1 ea	454.99	455
	fiinished water				
11.200328	12" DI pipe		24 lf	161.37	3,873
11.200333	12" DI bend	90 degree	2 ea	1,607.61	3,215
11.200334	12x8" DI reducer		2 ea	1,128.36	2,257
11.200341	8" DI pipe		8 lf	103.74	830
11.200351	8 butterfly valve	BFV	1 ea	1,577.28	1,577
	draindown air				
11.200358	3" s.s. pipe		212 lf	158.94	33,695
11.200359	3" s.s. 90 degree bend		6 ea	442.85	2,657
11.200360	3" s.s. tee		7 ea	661.24	4,629
11.200363	3" s.s. motorized gate valve	see EPG list	8 ea	0.00	0
11.200364	3" s.s. butterfly valve	BFV	2 ea	2,183.93	4,368
11.200365	3" s.s. swing check valve	CV	1 ea	2,911.90	2,912
11.200366	3" s.s. air filter insect screen		1 ea	303.32	303
11.200367	3" s.s. silencer		2 ea	715.08	1,430
	drains				
11.200377	4" DI drain to backwash tank		86 lf	69.76	5,999
11.200378	4" DI bend	90 degree	6 ea	424.65	2,548
	sample taps				
11.200378	tap 12" DI for 1" pipe	sample tap	4 ea	1,507.42	6,030
11.200379	1" polyethelene pipe	sample tap	496 lf	37.31	18,506
	well 3 building				
11.200442	Pipe, fittings & valves		272 sf	45.50	12,376
	well 4 building				
11.200443	Pipe, fittings & valves		272 sf	45.50	12,376

Code	Item Description		Quantity	Unit Price	Total
11.500000	INDUSTRIAL AND PROCESS EQUIPMENT				
11.600000	LABORATORY EQUIPMENT				
11.600001	lab refrigerator		1 ea	2,406.67	2,407
11.600002	fume hood	4'0"	1 ea	3,941.28	3,941
11.600003	ice maker		1 ea	2,208.48	2,208
11.600004	glass labware	allowance	1 ea	1,000.00	1,000
11.000000	EQUIPMENT	TOTAL COST	$372.21 /SF		$2,243,324

COSTPRO, INC.

Code	Item Description		Quantity	Unit Price	Total
12.000000	FURNISHINGS				$
12.350000	LABORATORY CASEWORK				
12.350003	base cabinets	wood	28 lf	651.22	18,234
12.350004	wall cabinets	wood	16 lf	475.67	7,611
12.350005	countertops	24" solid surface	22 lf	165.35	3,638
12.350006	cutout for sink		2 ea	94.57	189
12.500000	WINDOW TREATMENT				
12.500001	blinds, interior	N.I.C.	0 sf	5.66	0
12.500002	shades	N.I.C.	0 sf	10.53	0
12.510000	OFFICE FURNITURE				
12.510001	SCADA computer desk	allowance	1 ea	990.98	991
12.510002	chairs	allowance	1 ea	679.53	680
12.000000	FURNISHINGS	TOTAL COST	$5.98 /SF		$36,066

Code	Item Description		Quantity	Unit Price	Total
13.000000	SPECIAL CONSTRUCTION				$
13.340000	FABRICATED ENGINEERED STRUCTURES				
13.340001	pre-engineered steel building		6,027 sf	58.82	354,508
13.900000	UTILITY CONTROL SYSTEMS				
	PC&I				
13.900030	process instrumentation and controls		1 ls	225,139.32	225,139
13.900031	coordinate delivery, handle & store equipment			5%	11,257
13.900032	intall equipment	included		0%	0
13.900034	equipment hookups & rigging	included		0%	0
13.900035	SCADA programing		1 ls	50,000.00	50,000
13.900033	instrumentation subcontractor overhead & profit			15%	41,271
13.000000	SPECIAL CONSTRUCTION	TOTAL COST	$113.19 /SF		$682,175

PROJECT: WELLS 3 & 4 WATER TREATMENT PLANT
TOWN OF MEDFIELD
MEDFIELD, MASSACHUSETTS GAA 6,027 SF

COSTPRO, INC.

Code	Item Description		Quantity	Unit Price	Total
15.000000	MECHANICAL SUMMARY				$
15.100000	PLUMBING		$25.27	/SF	$152,318
15.400000	FIRE PROTECTION		$10.54	/SF	$63,495
15.500000	HVAC		$58.36	/SF	$351,712
15.000000	MECHANICAL SUMMARY	TOTAL COST	$94.16	/SF	$567,525

Code	Item Description		Quantity	Unit Price	Total
15.100000	PLUMBING				$
	water service & equipment				
15.100001	2"" backflow preventer		1 ea	1,698.61	1,699
15.100003	pumps, circ.		1 ea	2,517.58	2,518
	hot & cold water systems				
15.100017	hot & cold water pipe & fittings	unsized	799 lf	31.73	25,352
15.100022	pipe insulation	unsized	799 lf	30.94	24,721
15.100022	ball valve	3/4"	1 ea	183.21	183
15.100023	flow switch	1 1/4"	3 ea	388.25	1,165
15.100024	mixing valve	1 1/4"	4 ea	2,456.92	9,828
15.100025	relief valve	1 1/4"	3 ea	958.50	2,876
15.100026	swing check valve	2"	1 ea	509.58	510
15.100027	gate valve	2"	1 ea	333.66	334
	sanitary waste & vent system				
15.100028	waste & vent pipe & fittings	unsized	180 lf	66.73	12,011
15.100032	4" pipe & fittings	cast iron	120 lf	75.83	9,100
	propane gas system				
15.100034	gas pipe	1 1/2"	280 lf	32.15	9,002
	fixures				
15.100039	floor drain & trap primer	3"	8 ea	1,364.96	10,920
15.100040	hose bibb	3/4"	5 ea	70.88	354
15.100042	wall hydrant	non freeze	4 ea	757.71	3,031
15.100044	lab. sink , stainless steel	sample	1 ea	2,760.24	2,760
15.100045	lab. sink , stainless steel	countertop	1 ea	3,397.22	3,397
15.100046	lavatory	wall hung	1 ea	3,106.03	3,106
15.100047	24x24" service sink	floor	1 ea	4,094.87	4,095
15.100050	emergency eye wash & safety shower		3 ea	2,308.10	6,924
15.100054	water closet	floor mount	1 ea	2,171.80	2,172
15.100055	hot water heater, 119 gal	hubbell EMV	1 ea	4,810.02	4,810
15.100057	instantaneous water heater		2 ea	4,709.09	9,418
15.100058	master water heater controller, programmable		1 ea	2,032.27	2,032
15.400000	PLUMBING	TOTAL COST	$25.27 /SF		$152,318

PROJECT: WELLS 3 & 4 WATER TREATMENT PLANT
TOWN OF MEDFIELD
MEDFIELD, MASSACHUSETTS GAA 6,027 SF

COSTPRO, INC.

Code	Item Description		Quantity	Unit Price	Total
15.400000	FIRE PROTECTION				$
15.400002	6" reduced pressure zone assembly		1 ea	14,657.35	14,657
15.400007	sprinkler heads & pipe	pendant	80 ea	610.48	48,838
15.400000	FIRE PROTECTION	TOTAL COST	$10.54 /SF		$63,495

Code	Item Description		Quantity	Unit Price	Total
15.500000	HVAC				$
	chemical storage				
15.500001	inline exhaust fan	unsized	1 ea	3,306.22	3,306
15.500002	8" wall cap		2 ea	242.66	485
15.500003	10" wall cap		1 ea	363.99	364
15.500004	ductwork, corrosion resistant	unsized	400 lbs	17.16	6,864
15.500005	8" backdraft damper		2 ea	86.75	174
15.500006	10" backdraft damper		1 ea	92.21	92
15.500007	24"x24" backdraft damper		1 ea	280.27	280
15.500008	8"x8" supply register duct mtd		2 ea	50.96	102
15.500009	10"x10" supply register duct mtd		1 ea	70.98	71
15.500010	8"x8" exhaust grille duct mtd		3 ea	66.73	200
15.500011	electric unit heater, corrosion resistant	7.5kw	2 ea	1,953.40	3,907
15.500012	electric unit heater, corrosion resistant	12kw	2 ea	2,790.57	5,581
15.500013	thermostat		3 ea	164.82	494
	filter room & hall				
15.500014	split system dehumidifion unit	13 tons	1 ea	79,470.72	79,471
15.500015	air cooled condensing unit	13 tons	1 ea	9,706.35	9,706
15.500016	wall mounted dome exhaust fan	unsized	1 ea	3,033.23	3,033
15.500017	ductwork, stainless steel	unsized	250 lbs	655.18	163,795
15.500018	36"x36" backdraft damper		1 ea	946.37	946
15.500019	52"x36" motorized control damper		1 ea	2,820.91	2,821
15.500020	36"x36" duct mounted supply register		1 ea	424.65	425
15.500021	refrigerant lines	unsized	140 lf	36.40	5,096
15.500022	gas fired unit heater, 2 stage	60 mbh	4 ea	3,063.57	12,254
15.500023	thermostat		4 ea	164.82	659
	control room				
15.500024	split system unit	2 tons	1 ea	3,245.56	3,246
15.500025	air cooled condensing unit	2 tons	1 ea	2,214.26	2,214
15.500026	gas fired make-up air unit	500 cfm	1 ea	9,403.02	9,403
15.500028	fume hood exhaust fan	500 cfm	1 ea	2,911.90	2,912
15.500028	wall mounted fan	40 cfm	1 ea	709.78	710
15.500029	ductwork, corrosion resistant	unsized	300 lbs	17.16	5,148
15.500029	ductwork, galvanized steel	unsized	400 lbs	14.92	5,968
15.500030	2" fiberglass duct insulation	unsized	500 sf	5.68	2,840
15.500030	24"x24" backdraft damper		1 ea	280.27	280
15.500030	refrigerant lines	unsized	50 lf	36.40	1,820
15.500031	thermostat		1 ea	164.82	165
	electrical room				
15.500032	wall mounted fan	unsized	1 ea	1,516.62	1,517
15.500033	electric unit heater	5kw	1 ea	1,152.63	1,153
15.500034	thermostat		1 ea	164.82	165
	mechanical room				
15.500035	wall mounted fan	unsized	1 ea	1,516.62	1,517
15.500036	intake louver (make-up air)	unsized	1 ea	606.65	607
15.500037	electric unit heater	5kw	1 ea	1,152.63	1,153
15.500038	thermostat		1 ea	164.82	165
	toilet room				
15.500039	wall mounted fan	70 cfm	1 ea	709.78	710
15.500040	ductwork, galvanized steel	unsized	75 lbs	14.92	1,119
15.500041	wall mounted electric unit heater	3kw	1 ea	3,124.23	3,124
15.500042	thermostat		1 ea	164.82	165

Code	Item Description		Quantity	Unit Price	Total
	misc				
15.500128	systems testing & balancing		6,027 sf	0.91	5,485
15.500000	HVAC	TOTAL COST	$58.36 /SF		$351,712

Code	Item Description		Quantity	Unit Price	Total
16.000000	ELECTRICAL				$
16.100000	SERVICE & DISTRIBUTION				
16.100001	electrical service in ductbank	600A	216 lf	253.34	54,721
16.100002	main circuit breaker	600A	1 ea	7,226.73	7,227
16.100004	meter socket		1 ea	2,662.48	2,662
16.100006	480V/277A main distribution panel 600A MCB	800A	1 ea	33,312.70	33,313
16.100008	transformers	75 kva	1 ea	18,257.01	18,257
16.100013	new panelboard LV1 208/120V 3Ph4W	250A MCB	1 ea	8,716.45	8,716
16.200000	LIGHTING				
16.200001	lighting points		96 ea	43.45	4,171
16.200005	LED fixture 4'0" surface strip 4000K		90 ea	570.53	51,348
16.200011	LED fixture exterior flood 4000K		6 ea	1,774.99	10,650
16.200020	2 head emergency light & battery unit		10 ea	709.99	7,100
16.200021	2 head emergency light/exit sign combo unit		2 ea	494.46	989
16.200022	switch 1 way		7 ea	138.93	973
16.200023	switch 3 way		2 ea	249.06	498
16.200025	motion detector		1 ea	684.64	685
16.200026	photocell		1 ea	393.03	393
16.300000	POWER				
16.300001	duplex receptacle		18 ea	149.44	2,690
16.300002	duplex receptacle GFI		42 ea	198.53	8,338
16.300003	duplex receptacle waterproof GFI		2 ea	220.40	441
16.300004	quadraplex receptacle		1 ea	196.05	196
16.300007	junction box		30 ea	37.02	1,111
	branch circuits				
16.300010	3/4" C, (2)#12 (1)#12 EGC		4,650 lf	30.27	140,756
	feeders				
16.300016	200A feeder to pump station	in duct bank	1,168 lf	67.94	79,354
16.300017	250A feeder to pump station	in duct bank	542 lf	91.96	49,842
16.300018	feeder to transformer		6 lf	32.01	192
16.300019	feeder to panelboard LP1		6 lf	32.01	192
16.300020	feeder to backwash pumps		280 lf	39.97	11,192
16.300021	feeder to air scour blower		68 lf	39.97	2,718
16.300022	feeder to dehumidification unit		104 lf	39.97	4,157
16.300023	feeder to dehumidification condenser unit		110 lf	32.01	3,521
16.300024	feeder to electric unit heaters	3KW	79 lf	32.01	2,529
16.300025	feeder to electric unit heaters	5KW	40 lf	32.01	1,280
16.300026	feeder to electric unit heaters	7.5KW	117 lf	39.97	4,676
16.300027	feeder to electric unit heaters	12KW	70 lf	39.97	2,798
16.300028	feeder to gas fired unit heater fans		380 lf	32.01	12,164
16.300029	feeder to make-up air unit		55 lf	32.01	1,761
16.300030	feeder to control room split system		28 lf	39.97	1,119
16.300031	feeder to control room split system condenser		36 lf	32.01	1,152
16.300032	feeder to fume hood exhaust fan		33 lf	32.01	1,056
16.300033	feeder to overhead door		107 lf	39.97	4,277
16.300038	motor connections - backwash pumps		2 ea	465.74	931
16.300039	motor connections - air scour blower		1 ea	318.76	319
16.300040	motor connections - dehumidification unit		1 ea	318.76	319

Code	Item Description		Quantity	Unit Price	Total
16.300041	motor connections - dehumidification condenser unit		1 ea	318.76	319
16.300042	motor connections - electric unit heaters	3KW	2 ea	294.99	590
16.300043	motor connections - electric unit heaters	5KW	1 ea	294.99	295
16.300044	motor connections - electric unit heaters	7.5KW	2 ea	318.76	638
16.300045	motor connections - electric unit heaters	12KW	1 ea	318.76	319
16.300046	motor connections - gas fired unit heater fans		4 ea	318.76	1,275
16.300047	motor connections - make-up air unit		1 ea	318.76	319
16.300048	motor connections - control room split system		1 ea	318.76	319
16.300049	motor connections - control room split system condenser		1 ea	318.76	319
16.300050	motor connections - fume hood exhaust fan		1 ea	318.76	319
16.300051	motor connections - overhead door		1 ea	318.76	319
16.300063	variable frequency drive - backwash pumps	0-5 hp	2 ea	5,958.89	11,918
16.300064	variable frequency drive - fume hood exhaust	0-5 hp	1 ea	5,958.89	5,959
16.300065	variable frequency drive -make-up air unit	0-5 hp	1 ea	5,958.89	5,959
16.300069	air scour motor enclosed starter	unsized	1 ea	4,500.86	4,501
	well station #3				
16.300071	replace existing panelboard	250A	1 ea	9,152.28	9,152
16.300072	motor connections	75 hp process	1 ea	1,871.56	1,872
16.300073	variable frequency drive	75 hp	1 ea	27,512.30	27,512
	well station #4				
16.300075	replace existing panelboard	200A	1 ea	9,152.28	9,152
16.300076	motor connections	75 hp process	1 ea	1,871.56	1,872
16.300077	variable frequency drive	75 hp	1 ea	27,512.30	27,512
16.400000	COMMUNICATIONS & ALARM SYSTEMS				
	fire alarm				
16.400002	fire alarm system control panel		1 ea	8,050.83	8,051
16.400006	fire alarm horn/strobe light		10 ea	412.05	4,121
16.400007	fire alarm horn/strobe light, exterior weatherproof		1 ea	473.86	474
16.400008	fire alarm manual station		2 ea	363.87	728
16.400009	fire alarm visual signal		1 ea	304.28	304
16.400011	carbon monoxide detector		3 ea	1,052.31	3,157
16.400012	photoelectric smoke detector		2 ea	475.44	951
16.400015	heat detector		8 ea	450.09	3,601
16.400017	tamper switch		1 ea	405.71	406
16.400018	flow switch		1 ea	405.71	406
16.400022	fire alarm wiring & conduit		550 lf	14.04	7,722
	chemical alarm				
16.400023	chemical emergency alarm control panel		1 ea	2,091.95	2,092
16.400024	chemical alarm horn/strobe light		3 ea	412.05	1,236
16.400025	chemical alarm wiring & conduit		120 lf	14.04	1,685
	security wiring & conduit				
16.400026	intrusion detection alarm control panel		1 ea	2,091.95	2,092
16.400029	pan tilt zoom wall mounted security camera	IP HD color	4 ea	6,795.66	27,183
16.400030	DVR & monitor	IP HD color	1 ea	6,244.15	6,244
16.400031	video cable & conduit & conduit		375 lf	22.68	8,505
	communications				
16.400032	telephone/cable backboard		1 ea	253.57	254
16.400033	equipment rack		1 ea	2,535.19	2,535
16.400034	data outlets		3 ea	91.69	275
16.400036	data wiring & conduit		150 lf	10.05	1,508
	process & instrumentation				
16.400037	conduit & PC&I control wires	see EPG list		10%	22,514

Code	Item Description		Quantity	Unit Price	Total
16.543000	UNDERGROUND DUCTS AND RACEWAYS				
	power				
16.543005	pole drop for new service	by utility company	1 ea	0.00	0
16.543006	primary service ductbank (service by utility company)		90 lf	57.98	5,218
16.543007	transformer	by utility company	1 ea	0.00	0
16.543008	new electrical service ductbank	600A	216 lf	74.52	16,096
16.543009	new electrical service ductbank	600A from generator	34 lf	74.52	2,534
16.543010	new well 4 service ductbank	250A	542 lf	57.98	31,425
16.543011	new well 3a service ductbank	200A	1,168 lf	57.98	67,721
	communications				
16.543013	pole drop for new service		1 ea	1,267.85	1,268
16.543014	new fiberoptic service	allowance	296 lf	7.61	2,253
16.600000	EMERGENCY POWER				
16.600001	generator set, gas	400 kw WP	1 ea	250,531.01	250,531
16.600003	automatic transfer switch	600A	1 ea	17,369.52	17,370
16.600004	generator disconnect	600A WP	1 ea	4,786.13	4,786
16.600006	electrical service w/trenching	600A from generator	34 lf	216.71	7,368
16.600007	control cable	from generator	34 lf	47.49	1,615
16.700000	MISCELLANEOUS SYSTEMS				
16.700013	grounding systems		6,027 sf	0.32	1,929
16.000000	ELECTRICAL	TOTAL COST	$193.69 /SF		$1,167,382

ATTACHMENT 11

Preliminary Drawings

WELLS 3 & 4 WATER TREATMENT PLANT

INDEX

TOWN OF MEDFIELD, MA

MAY 2020

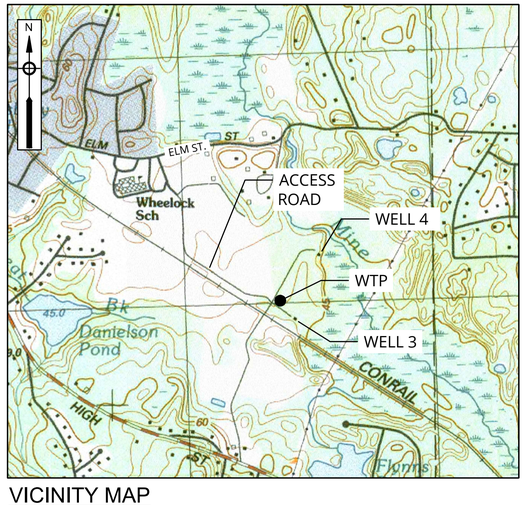
PRELIMINARY DESIGN

ENVIRONMENTAL PARTNERS

DEPARTMENT OF PUBLIC WORKS
MEDFIELD, MASSACHUSETTS
MAURICE GOULET - INTERIM DIRECTOR

BOARD OF SELECTMAN
GUS MURBY
OSLER PETERSON
MICHAEL MARCUCCI

TOWN ADMINISTRATOR
KRISTINE TRIERWEILER



VICINITY MAP
1"= 1000'

MEDFIELD WATER TREATMENT PLANT BUILDING LINE

12" DI OXIDIZED WATER

BFV-X 4" | 4" FILTER INFLUENT | ARV-X | FCV-X 6" | 6" DI BACKWASH WASTE

FCV-X | PI

BACKWASH AIR SUPPLY FROM AIR SCOUR BLOWER

3" SS BACKWASH AIR

6" MFM-X | DRAIN DOWN AIR | AFV-X | 3" SS

4" FV-X DRAINDOWN

PRESSURE FILTER #1 | #2 | #3 | #4

FV-X 6" FILTER TO WASTE

4" SLOW REFILL FV-X

AFV-X AIR SCOUR | 6" DI | 6" DI

10' ø FILTER AREA 77 SQ FT

DPIT X

6" BFV-X | FILTER EFFLUENT FV-X | PI | S

12" DI FILTERED WATER

WASHWATER SUPPLY

8" DI BACKWASH WASTE

12" FILTERED WATER

FILTERED WATER SAMPLE LINE TO ANALYZER AND LABORATORY SAMPLE SINK

POST-FILTRATION SODIUM BISULFITE (FUTURE USE)

D

SANITARY WASTE FROM LABORATORY GENERAL PURPOSE SINK, FLOOR DRAINS, AND TOILET

TIGHT TANK

RAW WATER SAMPLE LINE TO ANALYZER AND LABORATORY SAMPLE SINK

PIT X | M 12" BFV-X | BLIND FLANGE (TYP.)

FOR FUTURE PFAS SECONDARY TREATMENT

M 12" FV-X

8" BFV-X | 8" | CV-X 12"

M 12" FV-X

PSV-X 8" DI EMERGENCY WASHWATER SUPPLY

M 8" FV-X NORMALLY CLOSED

PRE-FILTRATION SODIUM HYPOCHLORITE

PRE-FILTRATION SODIUM HYDROXIDE

ARV-X | 12" DI OXIDIZED WATER | 12" BFV-X

OXIDIZED WATER SAMPLE LINE TO ANALYZER AND LABORATORY SAMPLE SINK

8" MFM-X | S

PRE-FILTRATION SPARE

POST-FILTRATION SODIUM HYPOCHLORITE

POST-FILTRATION SPARE

POST-FILTRATION SODIUM HYDROXIDE

4" DI EMERGENCY BACKWASH WASTE

NORMALLY CLOSED BFV-X 4"

ANALYZER WASTE FROM LABORATORY SAMPLE SINK AND ON-LINE ANALYZERS

BFV-X 4" | PI | CV-X 4" | WSV-X

VENT (TYP)

HANDWHEEL (TYP.)

8" GV-X | 8" GV-X

BACKWASH WASTE PUMP #1 BWWP-X

BACKWASH WASTE PUMP #2 BWWP-X

BACKWASH WASTE TANKS

RAW WATER FROM WELLS 3A & 4 — 12" DI RAW WATER

BACKWASH WASTE TO TANKER TRUCK

BACKWASH WASTE TO TOWN SEWER — 4" HDPE FORCE MAIN

FINISHED WATER TO DISTRIBUTION SYSTEM — 12" DI

4" BFV-X | 4" MFM-X | 4" DI BACKWASH RESIDUALS

8" MFM-X | BFV-X | 12" FINISH WATER

SRV-X | 3"

100' FINISHED WATER SAMPLE LINE TO ANALYZER AND LABORATORY SAMPLE SINK

PIT X

BFV-X | INTAKE SILENCER | 3" INLET AIR | ASB-X | AIR SCOUR BLOWER | DISCHARGE SILENCER | 3" BACKWASH AIR SUPPLY | BFV-X | CV-X

BACKWASH AIR SUPPLY TO FILTERS

AIR FILTER/ INSECT SCREEN

FLOW DESCRIPTION	FLOW (GPM)	NUMBER OF UNITS IN SERVICE (FORWARD FLOW)
MAXIMUM DESIGN (24 HOUR DAY)	1535	1 – WELL 3 WELL PUMP 1 – WELL 4 WELL PUMP 4 – PRESSURE FILTERS 1 – PRE-FILTRATION NaOCl METERING PUMP 1 – PRE-FILTRATION KOH METERING PUMP

MEDFIELD WATER TREATMENT PLANT BUILDING LINE

ENVIRONMENTAL PARTNERS

MARK	DATE	DESCRIPTION

Scale	NTS
Date	MAY, 2020
Job No.	134-1901
Designed by	TWS
Drawn by	TWS
Checked by	DNRP
Approved by	EAK

THIS LINE IS ONE INCH LONG WHEN PLOTTED AT FULL SCALE ON A 22" X 34" DRAWING

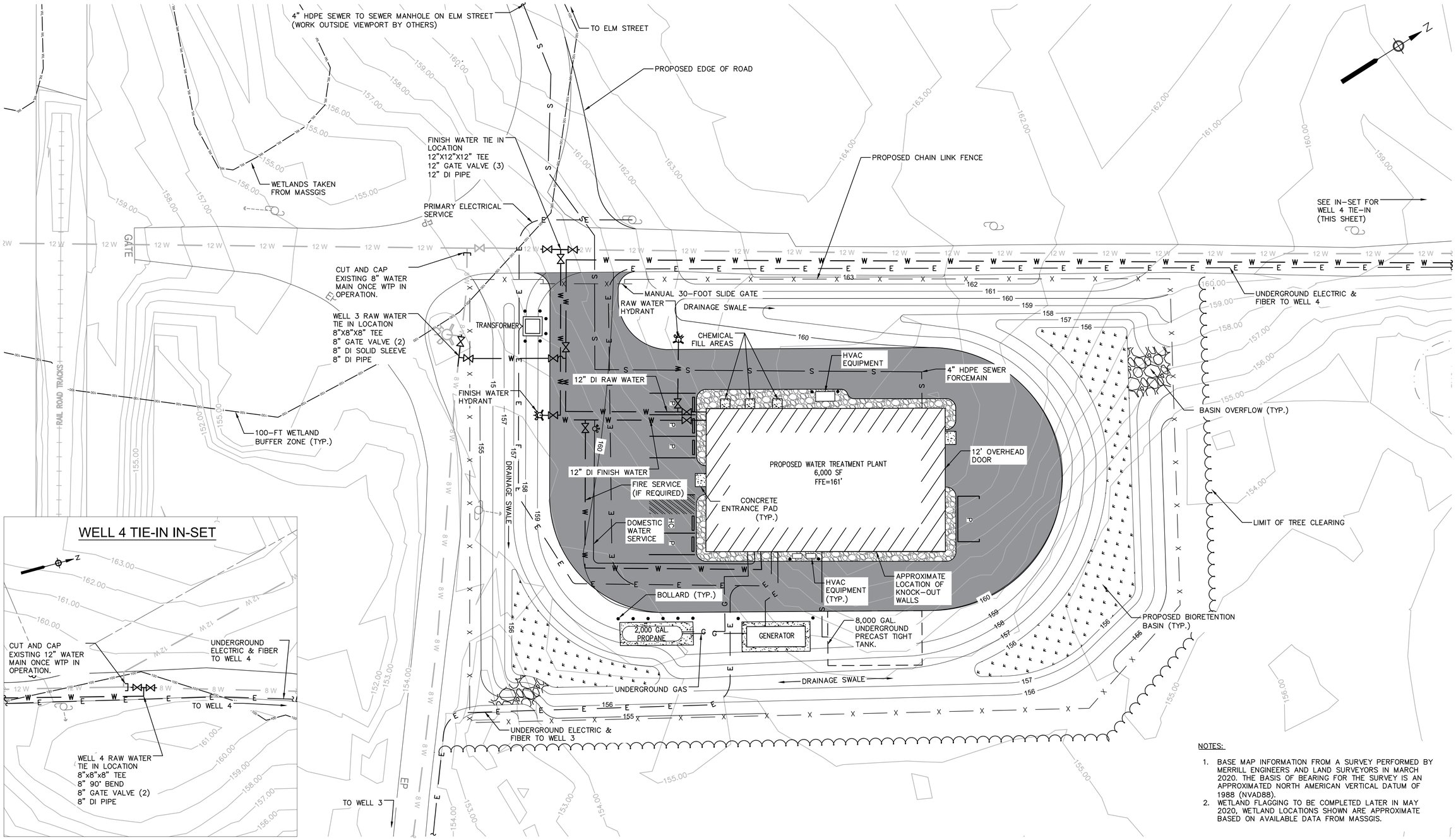
WELLS 3 & 4 WATER TREATMENT PLANT PRELIMINARY DESIGN
MEDFIELD, MASSACHUSETTS

PROCESS FLOW DIAGRAM

PRELIMINARY DESIGN

Sheet No. G-1

Drawing file: I:\Medfield\134\Water System\134-1901 – Wells 3-4\WTP Design\CAD\G-2 PROCESS FLOW DIAGRAM.dwg Plot Date: May 04,2020-3:57pm



NOTES:

1. BASE MAP INFORMATION FROM A SURVEY PERFORMED BY MERRILL ENGINEERS AND LAND SURVEYORS IN MARCH 2020. THE BASIS OF BEARING FOR THE SURVEY IS AN APPROXIMATED NORTH AMERICAN VERTICAL DATUM OF 1988 (NVAD88).
2. WETLAND FLAGGING TO BE COMPLETED LATER IN MAY 2020, WETLAND LOCATIONS SHOWN ARE APPROXIMATE BASED ON AVAILABLE DATA FROM MASSGIS.

ENVIRONMENTAL PARTNERS

MARK	DATE	DESCRIPTION

Scale	1"=20'
Date	MAY, 2020
Job No.	134-1901
Designed by	TWS
Drawn by	TWS
Checked by	DNRP
Approved by	EAK

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WELLS 3 & 4 WATER TREATMENT PLANT PRELIMINARY DESIGN
MEDFIELD, MASSACHUSETTS

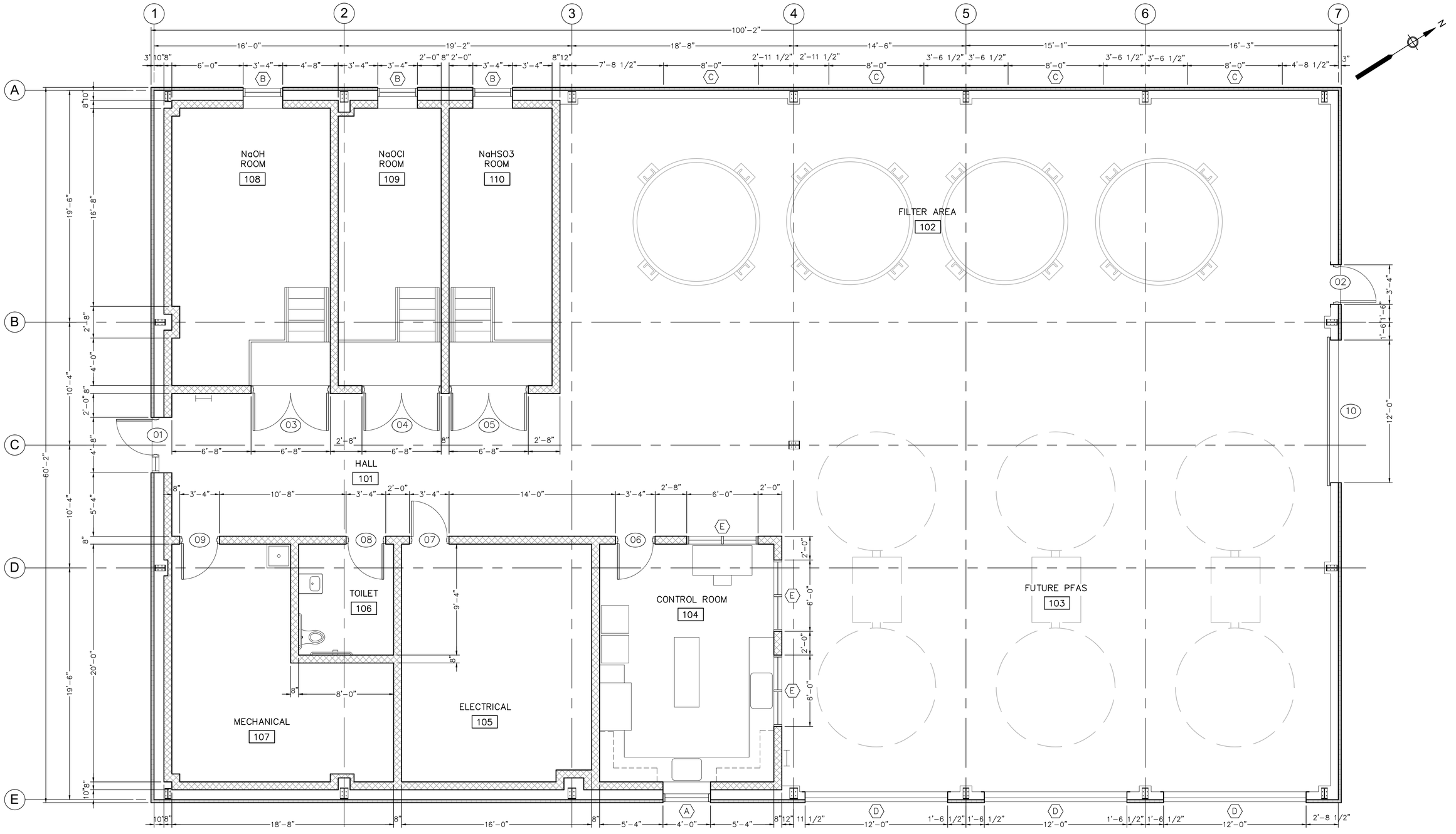
SITE PLAN

PRELIMINARY DESIGN

Sheet No.

C-1

Drawing file: I:\Medfield\134\Water System\134-1901 - Wells 3-4\WTP Design\CAD\CIVIL DRAWINGS (2.dwg Plot Date: May 04,2020-3:53pm



FIRST FLOOR PLAN

SCALE: 1/4"=1'-0"

ENVIRONMENTAL PARTNERS

CGKV Architects, Inc.

MARK	DATE	DESCRIPTION

Scale	AS SHOWN
Date	APRIL 2020
Job No.	134-1901
Designed by	JK
Drawn by	EZ
Checked by	JK
Approved by	

THIS LINE IS ONE INCH LONG WHEN PLOTTED AT FULL SCALE ON A 22" X 34" DRAWING

WELLS 3 & 4 WATER TREATMENT PLANT PRELIMINARY DESIGN
MEDFIELD, MASSACHUSETTS

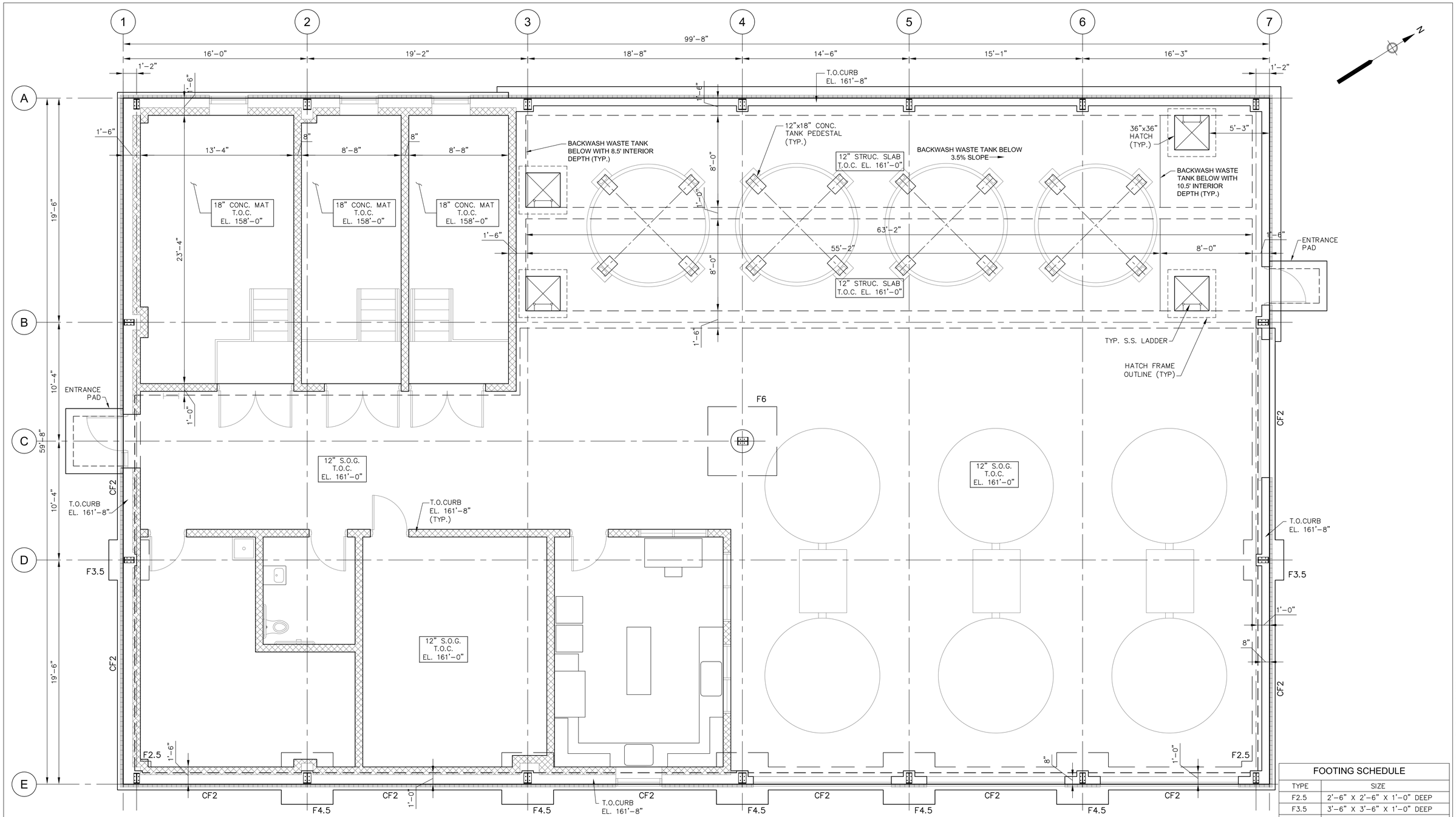
ARCHITECTURAL
FIRST FLOOR PLAN

PRELIMINARY DESIGN

Sheet No.

A-1

F:\Projects\Medfield WTP\Drawings\Archives\2020-05-04\A-1.dwg, 5/4/2020 5:02:18 PM



FIRST FLOOR PLAN

SCALE: 1/4" = 1'-0"

FOOTING SCHEDULE

TYPE	SIZE
F2.5	2'–6" X 2'–6" X 1'–0" DEEP
F3.5	3'–6" X 3'–6" X 1'–0" DEEP
F4.5	4'–6" X 4'–6" X 1'–0" DEEP
F6	6'–0" X 6'–0" X 1'–6" DEEP
CF2	2'–0" X 1'–0" DEEP X CONT.

TOWN OF MEDFIELD 1651

ENVIRONMENTAL PARTNERS

LIN ASSOCIATES, INC.
CONSULTING ENGINEERS
(617)566-4216 FAX (617)566-6038
BRIGHTON MASSACHUSETTS

MARK	DATE	DESCRIPTION

Scale	AS NOTED
Date	MAY, 2020
Job No.	134-1901
Designed by	GK
Drawn by	RL
Checked by	GK
Approved by	EJB

THIS LINE IS ONE INCH LONG WHEN PLOTTED AT FULL SCALE ON A 22" X 34" DRAWING

WELLS 3 & 4 WATER TREATMENT PLANT PRELIMINARY DESIGN
MEDFIELD, MASSACHUSETTS

STRUCTURAL
FIRST FLOOR PLAN

PRELIMINARY DESIGN

Sheet No.

S-1

Drawing file: E:\2020\307 Medfield WTP Preliminary Design (EP)\STRUS\-1 First Floor Plan.dwg Plot Date: May 01 2020-11:16am

12" DI RAW WATER

12" DI FINISH WATER

A
M-2

MP-1,2,3&4
NaOCL

MP-1&2
NaOH

NaOH
CHEMICAL
FEED AND
STORAGE

TP-1
NaOCL

TP-2
NaOCL

NaOCl
CHEMICAL
FEED AND
STORAGE

FUTURE
NaHSO3
CHEMICAL
FEED AND
STORAGE

4000 GALLON
TANK (NaOH)

6" DI
BACKWASH
WASTE
(TYP.)

8" DI
BACKWASH
WASTE
(UNDER SLAB)

BLOWER FOR
AIR SCOUR
SYSTEM

FILTER 4
10' I.D.
PRESSURE
FILTER VESSEL

FILTER 3
10' I.D.
PRESSURE
FILTER VESSEL

FILTER 2
10' I.D.
PRESSURE
FILTER VESSEL

FILTER 1
10' I.D.
PRESSURE
FILTER VESSEL

12" DI OXIDIZED WATER

FUTURE PFAS
SECONDARY TREATMENT
HOOKUP LOCATION

4" BACKWASH WASTE
EMERGENCY TRUCK
HOOKUP

4" BACKWASH
WASTE PUMPS

VT

4'-6"

ANALYZER BANK
(DRAIN TO BACKWASH WASTE TANK)

MECHANICAL
ROOM

ELECTRICAL
ROOM

CONTROL
ROOM

SAMPLE SINK
(DRAIN TO BACKWASH WASTE TANK)

FUTURE
GAC
PRESSURE
FILTER SYSTEM

LAB SINK
(DRAIN TO TIGHT TANK)

N

TOWN OF MEDFIELD 1651

ENVIRONMENTAL PARTNERS

MARK	DATE	DESCRIPTION

Scale	1/4"=1'
Date	MAY, 2020
Job No.	134-1901
Designed by	TWS
Drawn by	TWS
Checked by	DNRP
Approved by	EAK

THIS LINE IS ONE INCH LONG WHEN PLOTTED AT FULL SCALE ON A 22" X 34" DRAWING

WELLS 3 & 4 WATER TREATMENT PLANT PRELIMINARY DESIGN
MEDFIELD, MASSACHUSETTS

PROCESS MECHANICAL FLOOR PLAN

PRELIMINARY DESIGN

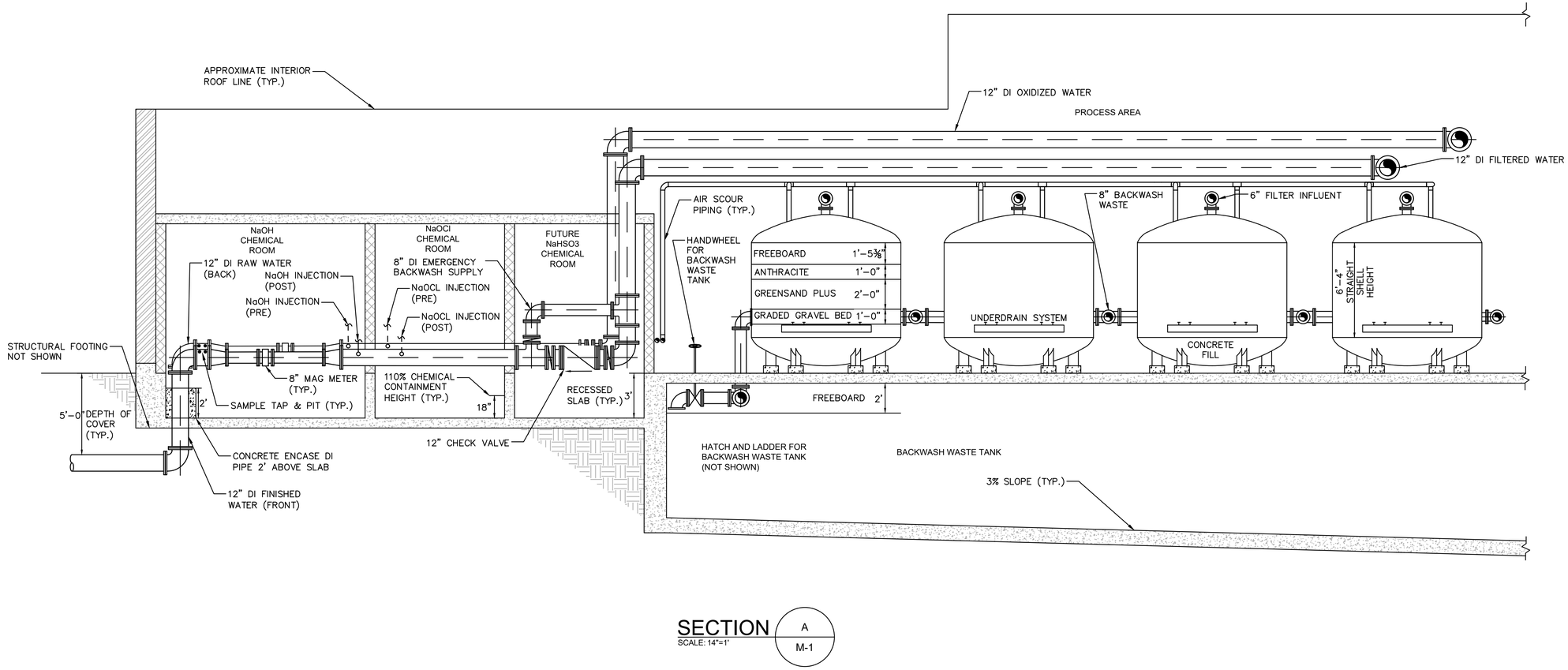
Sheet No.

M-1

Drawing file: i:\Medfield\134\Water System\134-1901 - Wells 3-4\WTP Design\CAD\MECH DRAWINGS.dwg Plot Date: May 04,2020 - 4:03pm

NOTES:

1. CHEMICAL FEED EQUIPMENT NOT SHOWN FOR CLARITY.
2. PRESSURE FILTER VALVES NOT SHOWN FOR CLARITY.



SECTION A / M-1
SCALE: 14"=1'

			Scale	1/4"=1'
			Date	MAY, 2020
			Job No.	134-1901
			Designed by	TWS
			Drawn by	TWS
			Checked by	DNRP
MARK	DATE	DESCRIPTION	Approved by	EAK

THIS LINE IS ONE INCH LONG WHEN PLOTTED AT FULL SCALE ON A 22" X 34" DRAWING

ENVIRONMENTAL PARTNERS

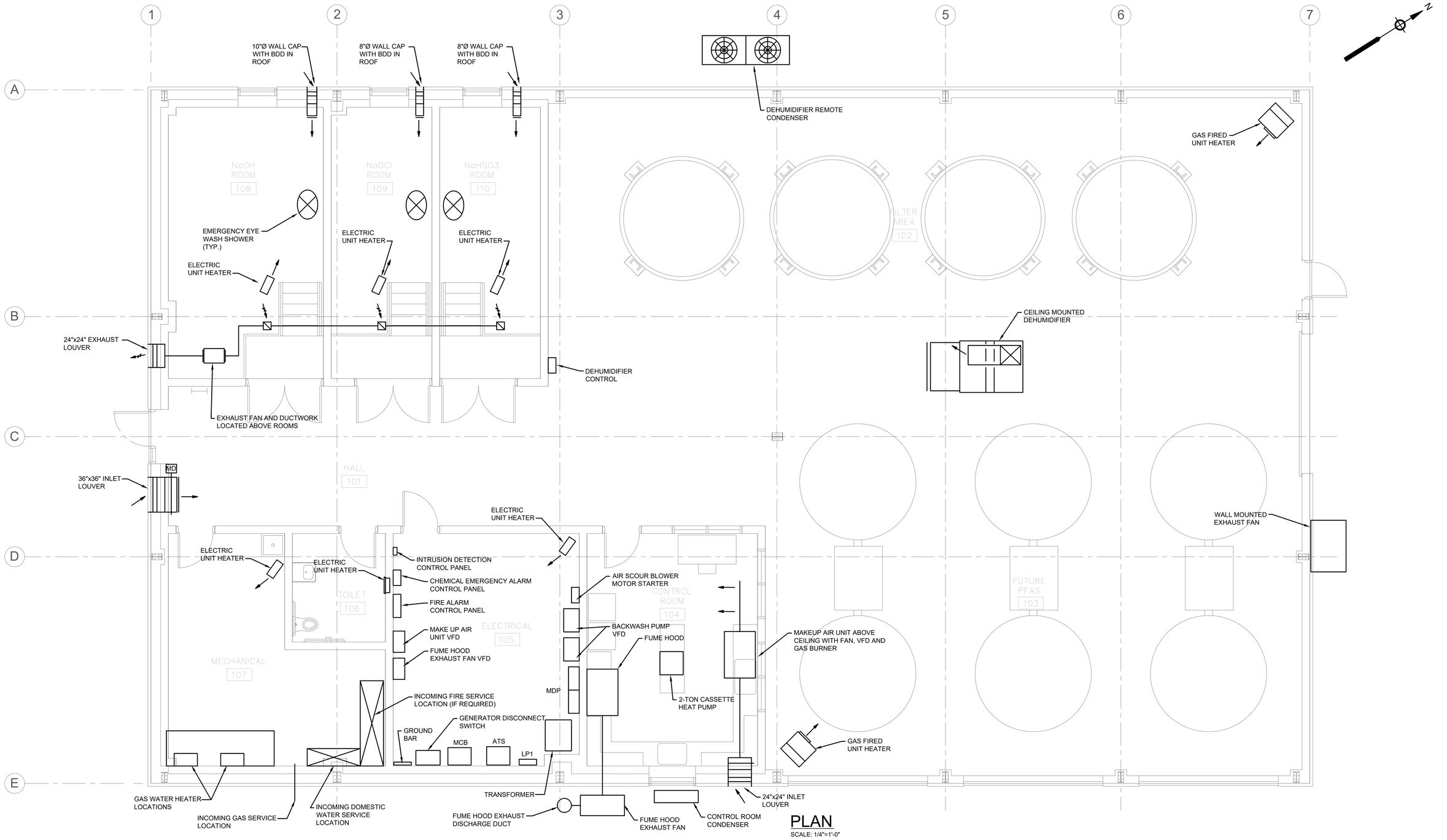
WELLS 3 & 4 WATER TREATMENT PLANT PRELIMINARY DESIGN
MEDFIELD, MASSACHUSETTS

PROCESS MECHANICAL SECTION

PRELIMINARY DESIGN

Sheet No. M-2

Drawing file: I:\Medfield\134\Water System\134-1901 - Wells 3-4\WTP Design\CAD\MECH DRAWINGS.dwg Plot Date: May 04,2020-4:20pm



PLAN

SCALE: 1/4"=1'-0"

ENVIRONMENTAL PARTNERS

SAR ENGINEERING, INC.

Mechanical/Electrical Engineers
150 Grossman Drive, Suite 309
Braintree, Massachusetts 02184
617 328-9215
web: www.sar.com

MARK	DATE	DESCRIPTION		
			Scale	1/4"=1'-0"
			Date	MAY, 2020
			Job No.	134-1901
			Designed by	RLB
			Drawn by	RLB
			Checked by	MC
			Approved by	MC

THIS LINE IS ONE INCH LONG WHEN PLOTTED AT FULL SCALE ON A 22" X 34" DRAWING

WELLS 3 & 4 WATER TREATMENT PLANT PRELIMINARY DESIGN
MEDFIELD, MASSACHUSETTS

MEP EQUIPMENT LOCATIONS

PRELIMINARY DESIGN

Sheet No.

MEP-1

Drawing file: W:\Year - 2020\20007.00 - Medfield Wells 3 & 4 Water Treatment Plant\MEP-1.dwg Plot Date: May 01, 2020 - 10:14am

MEDFIELD WATER TREATMENT PLANT

ROOM LINE
CONTROL PANEL
LOCATIONAL DIVIDE / BUILDING LINE
FIELD/SIGNAL WIRING
DATA / COMMUNICATION
ELECTRICAL WIRING

CONTROL ROOM

MAIN CONTROL PANEL

CELLULAR NETWORK
CELLULAR NETWORK
CELLUARY GATEWAY
CELLUARY GATEWAY (BACKUP)
PLANT PLC
OIT TOUCHSCREEN
UPS
ETHERNET SWITCH
FIBER–COPPER SWITCH
FIBER–OPTIC
CAT–6E
HMI SCADA PC WORKSTATION
PRINTER

FILTER EQUIPMENT AND CONTROLS
- VALVE ACTUATORS
- FLOW METERS
- DIFFERENTIAL PRESSURE TRANSMITTERS

FIELD EQUIPMENT
- AIR SCOUR BLOWER
- VALVE ACTUATORS
- CHEMICAL FEED PUMPS
- CHEMICAL TRANSFER PUMPS

INSTRUMENTATION
- FLOW METERS
- PRESSURE TRANSMITTERS
- BACKWASH TANK LEVEL TRANSMITTERS
- CHEMICAL TANK LEVEL TRANSMITTERS
- CHEMICAL TANK FLOAT SWITCHES
- FLOAT SWITCHES
- FLOW SWITCHES
- MAN DOWN SWITCHES
- ANALYZERS
- TEMPERATURE TRANSMITTERS
- INTRUSION ALARM

FIRE ALARM CONTROL PANEL
- FIRE ALARM
- FIRE SUPPRESSION SYSTEM

HAVC CONTROL PANEL
- ZONE AIR TEMPERATURE
- ZONE HUMIDITY

ELECTRICAL ROOM

BACKWASH WASTE PUMPS VFD CONTROLS
H/O/A
STATUS
SPEED
SECURITY SYSTEM CONTROL PANEL

FIELD EQUIPMENT
- BACKWASH WASTE PUMPS

FIELD EQUIPMENT
- SECURITY CAMERAS

GENERATOR
STATUS

INSTRUMENTATION
- TIGHT TANK FLOAT SWITCHES
- PROPANE TANK PRESSURE TRANSMITTER

WELL 3/3A STATION

CONTROL PANEL

PLC
OIT
NETWORK SWITCH
UPS
FIBER–COPPER SWITCH

WELL PUMP VFD CONTROLS
H/O/A
STATUS
SPEED

INSTRUMENTATION
- FLOW METER
- PRESSURE TRANSMITTER
- LEVEL TRANSMITTER
- INTRUSION ALARM

WELL 4 STATION

CONTROL PANEL

PLC
OIT
NETWORK SWITCH
UPS
FIBER–COPPER SWITCH

WELL PUMP VFD CONTROLS
H/O/A
STATUS
SPEED

INSTRUMENTATION
- FLOW METER
- PRESSURE TRANSMITTER
- LEVEL TRANSMITTER
- INTRUSION ALARM

FIBER–OPTIC

SCADA SYSTEM ARCHITECTURE NOTES:

1. COMMUNICATIONS: CELLULAR AND FIBER OPTIC
2. PLC SYSTEM: ALLEN BRADLEY
3. SCADA SOFTWARE: GE iFIX WITH XL REPORTER & WIN 911

ENVIRONMENTAL PARTNERS

MARK	DATE	DESCRIPTION

Scale	NTS
Date	MAY, 2020
Job No.	134-1901
Designed by	TWS
Drawn by	TWS
Checked by	DNRP
Approved by	EAK

THIS LINE IS ONE INCH LONG WHEN PLOTTED AT FULL SCALE ON A 22" X 34" DRAWING

WELLS 3 & 4 WATER TREATMENT PLANT PRELIMINARY DESIGN
MEDFIELD, MASSACHUSETTS

SCADA SCHEMATIC

PRELIMINARY DESIGN

Sheet No.

I-1

Drawing file: I:\Medfield\134\Water System\134-1901 - Wells 3-4\WTP Design\CADd-1 PROPOSED SCADA DIAGRAM.dwg Plot Date: May 04,2020-4:39pm

ENVIRONMENTAL PARTNERS

1900 Crown Colony Drive, Suite 402
Quincy, MA 02169
P: 617.657.0200 F: 617.657.0201

envpartners.com