CITY OF RIPLEY
JACKSON COUNTY, WEST VIRGINIA

PHASE II – PROPOSED SANITARY SEWER SYSTEM IMPROVEMENTS PROJECT
CONTRACT #3 – PROPOSED 1.2 MGD WASTEWATER TREATMENT PLANT

ADDENDUM #3

MARCH 25, 2022

THRASHER PROJECT #020-01535

TO WHOM IT MAY CONCERN:

A Pre-Bid Conference was held on Tuesday, March 1, 2022, for the above-referenced project. The following are clarifications and responses to questions posed by contractors for the above reference project.

A. GENERAL

NONE

B. SPECIFICATIONS

1. 2.0 Index

2. Specification 084113 – Aluminum-Framed Entrances
   a. Specification has been added to clarify aluminum doors

3. Specification 262934 – VFDs for Submersible Pumps
   b. Specification has been revised to correct the pump station name in Section 2.1.A

2. Specification 461216 – Grit Removal Equipment
   a. Specification has been revised to include SAVECO as a named manufacturer

4. Specification 461320 – NPW Packaged Pumping System
   b. Specification has been revised

C. DRAWINGS

1. Sheets 71 and 74
   a. Revised to update NPW pump information and references.

2. Sheet 94
   a. Revised to include corrected pump information.

D. QUESTIONS AND RESPONSES

NONE

E. CLARIFICATIONS

1. NPW Packaged Pumping System specification has been revised.

If you have any questions or comments, please feel free to contact me at your earliest convenience. As a reminder, bids will be received until 2:00 p.m. on Wednesday, March 30, 2022, at 203 S. Church Street, Ripley, WV 25271.

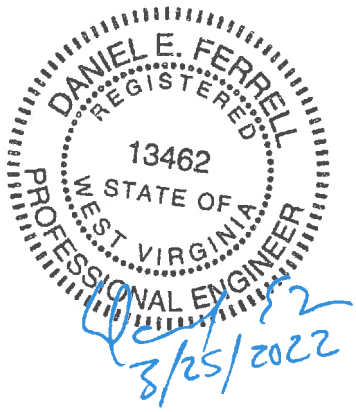
Sincerely,

THE THRASHER GROUP, INC.

DANIEL E. FERRELL, P.E.
Project Manager

Enclosures:

Index Volume 1
Specification 084113 – Aluminum-Framed Entrances
Specification 262934 – VFDs for Submersible Pumps
Specification 461216 – Grit Removal Equipment
Specification 461320 – NPW Packaged Pumping System
Plan Sheets



Revised per Addendum #3
March 25, 2022

PROPOSED
CITY OF RIPLEY
JACKSON COUNTY, WEST VIRGINIA
PHASE II – PROPOSED SANITARY SEWER SYSTEM IMPROVEMENTS PROJECT
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VOLUME 1

- I N D E X -

BIDDING DOCUMENTS

CONDITIONS OF WORK

Notice of Acceptability	C-626
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Supplementary Conditions	C-800
RUS – WV Supplemental General Conditions	RUS
Additional Supplemental General Conditions	ASGC
American Iron and Steel	AISR
Davis Bacon Contract Requirements	DB
DBE Requirements	DBE

TECHNICAL SPECIFICATIONS

Summary	011000
Price and Payment Procedures	012000
Substitution Procedures	012500
Administrative Requirements	013000
Construction Progress Schedule	013216
Submittal Procedures	013300
Quality Requirements	014000
References	014200
Temporary Facilities and Controls	015000
Products Requirements	016000
Execution and Closeout Requirements	017000
Operation and Maintenance Data	017823
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Demonstration and Training	017900

Revised per Addendum #3
March 25, 2022

Commissioning	019100
Selective Demolition	024119
Cast-In-Place Concrete	033000
Antimicrobial Crystalline Concrete Waterproofing	033060
Grouting	036000
Concrete Masonry Unit	042200
Cast Stone Masonry	047200
Metal Fabrications	055000
Pipe and Tube Railings	055213
Bar Gratings	055313
Rough Carpentry	061000
Sheathing	061600
Shop Fabricated Wood Trusses	061753
Wood Trim	064600
Cold Fluid-Applied Waterproofing	071416
Thermal Insulation	072100
Weather Barriers	072500
Vapor Retarders	072600
Standing-Seam Metal Roof Panels	074113.16
Plastic Siding	074633
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Revised per Addendum #3
March 25, 2022

Expansion Control	079500
Hollow Metal Doors and Frames	081113
Overhead Coiling Doors	083323
Access Hatches	083500
Aluminum-Framed Entrances	084113
Vinyl Windows	085313
Door Hardware	087100
Glazing	088000
Acoustical Tile Ceilings	095123
Coating Systems for Wastewater Treatment Plants	099010
Metal Toilet Compartments	102113.13
Warning Signs	104411
Fire Extinguishers	104416
Laboratory Equipment, Supplies and Chemicals	115300
Metal Laboratory Casework	123553.13

SECTION 084113 - ALUMINUM-FRAMED ENTRANCES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Manual-swing entrance doors.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For aluminum-framed entrances. Include plans, elevations, sections, full-size details, and attachments to other work.

1. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers.
2. Include point-to-point wiring diagrams.

C. Samples: For each type of exposed finish required.

D. Entrance Door Hardware Schedule: Prepared by or under supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams.

E. Delegated-Design Submittal: For aluminum-framed entrances and storefronts indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site

1.4 INFORMATIONAL SUBMITTALS

A. Energy Performance Certificates: NFRC-certified energy performance values from manufacturer.

B. Product test reports.

C. Source quality-control reports.

D. Field quality-control reports.

E. Sample warranties.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

B. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.

1. Do not change intended aesthetic effects, as judged solely by Engineer, except with Engineer's approval. If changes are proposed, submit comprehensive explanatory data to Engineer for review.

1.7 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of aluminum-framed entrances that do not comply with requirements or that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

B. Special Finish Warranty: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of factory-applied finishes within specified warranty period.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Comply with performance requirements specified, as determined by testing of aluminum-framed entrances representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.

1. Aluminum-framed entrances shall withstand movements of supporting structure, including, but not limited to, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
2. Failure also includes the following:

a. Thermal stresses transferring to building structure.
b. Glass breakage.
c. Noise or vibration created by wind and thermal and structural movements.
d. Loosening or weakening of fasteners, attachments, and other components.
e. Failure of operating units.

B. Deflection of Framing Members

1. Deflection Normal to Wall Plane: Limited to edge of glass in a direction perpendicular to glass plane not exceeding 1/175 of the glass edge length for each individual glazing lite or an amount that restricts edge deflection of individual glazing lites to 3/4 inch, whichever is less.
2. Deflection Parallel to Glazing Plane: Limited to 1/360 of clear span or 1/8 inch, whichever is smaller.

C. Air Infiltration: Test according to ASTM E 283 for infiltration as follows:

1. Fixed Framing and Glass Area:

a. Maximum air leakage of 0.06 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft..

2. Entrance Doors:

a. Single Doors: Maximum air leakage of 0.5 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft..

D. Water Penetration under Static Pressure: Test according to ASTM E 331 as follows:

1. No evidence of water penetration through fixed glazing and framing areas, including entrance doors, when tested according to a minimum static-air-pressure differential of 6.24 lbf/sq. ft..

E. Energy Performance: Certify and label energy performance according to NFRC as follows:

1. Thermal Transmittance (U-factor): Fixed glazing and framing areas as a system shall have U-factor of not more than 0.41 Btu/sq. ft. x h x deg F as determined according to NFRC 100.
2. Solar Heat Gain Coefficient (SHGC): Fixed glazing and framing areas as a system shall have SHGC of no greater than 0.29 as determined according to NFRC 200.
3. Condensation Resistance: Fixed glazing and framing areas as a system shall have an NFRC-certified condensation resistance rating of no less than 55 as determined according to NFRC 500.

F. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 ENTRANCE DOOR SYSTEMS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. George L. Wilson Company of West Virginia.
2. EFCO Corporation.
3. Kawneer North America, an Arconic company.
4. Tubelite Inc.
5. YKK AP America Inc.

B. Alternate Manufacturers:

1. Engineer's approved equal.

C. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing operation.

1. Door Construction: 1-3/4-inch overall thickness, with minimum 0.125-inch- thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.
2. Door Design: Wide stile; 5-inch nominal width.
3. Glazing Stops and Gaskets: Beveled , snap-on, extruded-aluminum stops and preformed gaskets.

a. Provide nonremovable glazing stops on outside of door.

2.3 ENTRANCE DOOR HARDWARE

A. Entrance Door Hardware: Hardware not specified in this Section is specified in Section 087100 "Door Hardware."

B. General: Provide entrance door hardware for each entrance door, to comply with requirements in this Section.

1. Entrance Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and products complying with BHMA standard referenced.
2. Sequence of Operation: Provide electrified door hardware function, sequence of operation, and interface with other building control systems indicated.
3. Opening-Force Requirements:

a. Egress Doors: Not more than 15 lbf to release the latch and not more than 30 lbf to set the door in motion and not more than 15 lbf to open the door to its minimum required width.
b. Accessible Interior Doors: Not more than 5 lbf to fully open door.

C. Designations: Requirements for design, grade, function, finish, quantity, size, and other distinctive qualities of each type of entrance door hardware are indicated in "Entrance Door

Hardware Sets" Article. Products are identified by using entrance door hardware designations as follows:

1. References to BHMA Standards: Provide products complying with these standards and requirements for description, quality, and function.

D. Cylinders: As specified in Section 087100 "Door Hardware."

E. Pivot Hinges: BHMA A156.4, Grade 1.

F. Butt Hinges: BHMA A156.1, Grade 1, radius corner.

1. Nonremovable Pins: Provide setscrew in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while entrance door is closed.
2. Exterior Hinges: As specified in Section 087100 "Door Hardware".
3. Quantities:

    a. For doors up to 87 inches high, provide three hinges per leaf.
    b. For doors more than 87 and up to 120 inches high, provide four hinges per leaf.

G. Continuous-Gear Hinges: BHMA A156.26.

H. Mortise Auxiliary Locks: BHMA A156.5, Grade 1.

I. Automatic and Self-Latching Flush Bolts: BHMA A156.3, Grade 1.

J. Panic Exit Devices: BHMA A156.3, Grade 1, listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for panic protection, based on testing according to UL 305.

K. Strikes: Provide strike with black-plastic dust box for each latch or lock bolt; fabricated for aluminum framing.

L. Operating Trim: BHMA A156.6.

M. Closers: BHMA A156.4, Grade 1, with accessories required for a complete installation, sized as required by door size, exposure to weather, and anticipated frequency of use; adjustable to comply with field conditions and requirements for opening force.

N. Concealed Overhead Holders and Stops: BHMA A156.8, Grade 1.

O. Door Stops: BHMA A156.16, Grade 1, floor or wall mounted, as appropriate for door location indicated, with integral rubber bumper.

P. Weather Stripping: Manufacturer's standard replaceable components.

1. Compression Type: Made of ASTM D 2000 molded neoprene or ASTM D 2287 molded PVC.
2. Sliding Type: AAMA 701/702, made of wool, polypropylene, or nylon woven pile with nylon-fabric or aluminum-strip backing.

Q. Weather Sweeps: Manufacturer's standard exterior-door bottom sweep with concealed fasteners on mounting strip.

R. Thresholds: BHMA A156.21 raised thresholds beveled with a slope of not more than 1:2, with maximum height of 1/2 inch.

2.4 GLAZING

A. Glazing: Comply with Section 088000 "Glazing."

B. Glazing Gaskets: Manufacturer's standard sealed-corner pressure-glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers.

C. Glazing Sealants: As recommended by manufacturer.

2.5 MATERIALS

A. Sheet and Plate: ASTM B 209.

B. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.

C. Extruded Structural Pipe and Tubes: ASTM B 429/B 429M.

D. Structural Profiles: ASTM B 308/B 308M.

E. Steel Reinforcement:

1. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
2. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
3. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.
4. Primer: Manufacturer's standard zinc-rich, corrosion-resistant primer complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM, and prepare surfaces according to applicable SSPC standard.

2.6 FABRICATION

A. Form or extrude aluminum shapes before finishing.

B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

C. Fabricate components that, when assembled, have the following characteristics:

1. Profiles that are sharp, straight, and free of defects or deformations.
2. Accurately fitted joints with ends coped or mitered.
3. Physical and thermal isolation of glazing from framing members.

4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
5. Provisions for field replacement of glazing from [**exterior**].
6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.

E. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.

F. Entrance Doors: Reinforce doors as required for installing entrance door hardware.

G. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.

H. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.7 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:

1. Comply with manufacturer's written instructions.
2. Do not install damaged components.
3. Fit joints to produce hairline joints free of burrs and distortion.
4. Rigidly secure nonmovement joints.
5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
6. Seal perimeter and other joints watertight unless otherwise indicated.

B. Metal Protection:

1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with materials recommended by manufacturer for this purpose or by installing nonconductive spacers.
2. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Set continuous sill members and flashing in full sealant bed, as specified in Section 079200 "Joint Sealants," to produce weathertight installation.

D. Install components plumb and true in alignment with established lines and grades.

E. Install glazing as specified in Section 088000 "Glazing."

F. Entrance Doors: Install doors to produce smooth operation and tight fit at contact points.

1. Exterior Doors: Install to produce weathertight enclosure and tight fit at weather stripping.
2. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware according to entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

END OF SECTION 084113

SECTION 262934 - VARIABLE FREQUENCY DRIVES FOR SUBMERSIBLE PUMPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 01, and all related Specification Sections apply, to this Section.

1.2 SUMMARY

A. Section includes: Variable Frequency Drives (VFDs)

1.3 RELATED REQUIREMENTS

A. Section 333219 – Submersible Non-Clog Pump Station

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Performance Data

1. Based on actual tests of similar equipment and include sufficient data to demonstrate suitability of the VFD for the conditions specified.

1.5 CLOSEOUT SUBMITTALS

A. Closeout Submittals must be received by Engineer and Owner before the equipment specified in this Section can be considered Substantially Complete.

B. Operation and maintenance data.

C. Manufacturer's representative reports from equipment start-up.

1.6 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70 (NEC), by a qualified testing agency, and marked for intended location and application.

B. UL Compliance: Comply with UL 674 for submersible sewage pumps suitable for use in classified locations.

C. Materials and Workmanship shall be in accordance with the following standards as referenced herein.

1. ANSI - American National Standards Institute.
2. ASTM - American Society for Testing and Materials.
3. AWS - American Welding Society.
4. HI - Hydraulic Institute.
5. IEEE - Institute of Electrical and Electronics Engineers.
6. NEMA - National Electrical Manufacturers Association.
7. AFBMA - Anti-Friction Bearing Manufacturers Association.
8. API - American Petroleum Institute.

D. VFD shall have a minimum design life of 10 years. Must be part of the submitted documentation.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Delivery

1. Ship all units assembled as much as practical.
2. Label all units with all labeling intact and legible with item name, model number, size, and manufacturer's name.

B. Storage

1. Store all units, accessories, and components in the manufacturer's original package, under cover and protected from damage.

C. Handling

1. Handle all units and components in accordance with the manufacturer's instructions.
2. Use lifting rings and canvas harnesses for lifting to prevent scratching or abrading finished surfaces.
3. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover, to protect units from dirt, water, construction debris, and traffic.
4. Handle carefully, in accordance with manufacturer's written instructions, to avoid damage to components, enclosure, and finish.

PART 2 - PRODUCTS

2.1 SYSTEM OVERVIEW

A. A Variable Frequency Drive (VFD) shall be provided and sized for the appropriate voltage and horsepower indicated on the Drawings and specified in other Sections. The VFD and VFD Control System shall be of a design purposely for wastewater pumping and functionally pre-programmed for the specific pump model used. The VFD shall provide all level control functionality, hand/auto operation, pump alternation, pump over temperature monitoring, seal

leakage monitoring and phase conversion if necessary. The Plant Pump Station shall provide smart technology to include pump self-cleaning, sump cleaning, pipe cleaning algorithms shall also include capability to monitor station inflow, pump speed and energy consumption in order to automatically operate the lift station at optimal energy efficiency. Include external H-O-A control module for integration of H-O-A switches.

B. The VFD shall be a Flygt, ABB or engineers approved equal.

C. The VFD's and controls shall be mounted in a NEMA 4X Stainless Steel enclosure.

D. The enclosure shall have a NEMA 4X Stainless Steel ventilation system.

E. The enclosure shall have a thermostatically controlled heater to prevent low temperatures and condensation.

F. The enclosure shall have an internal circulation fan or air conditioner to prevent heat buildup.

2.2 HARDWARE

A. The VFD shall incorporate the following characteristics:
1. VFD shall be 480 volts, 60 Hz, 3 Phase.
2. Supply Frequency: 48-62 Hz
3. Phase Imbalance: 3% maximum
4. Inrush Current: less than motor rated current
5. Power Cycles: 120/hour
6. Output Power: .75 to 100 HP at 480 VAC.
7. Overload Capacity: 110% for 60 sec., 125% for 2 sec
8. Output Frequency: up to 80 Hz
9. Ambient Temp.:
    a. Storage -4 to 140 deg F
    b. Operating 14 to 104 deg F
10. Humidity: 95% max, non-condensing
11. Enclosure: IP 55
12. Digital Inputs: 10-30VDC internal or external supply, NPN
13. DI Response time: < 4ms
14. Power Supply: 24VDC, 100mA, Short Circuit protected
15. Analog Inputs: 0/4-20mA, 0/24V, 30VDC max
16. AI Resolution: 12 bits + sign
17. AI Response Time: < 4ms
18. AI Accuracy: > 1% of full scale Analog Outputs: 4-20mA, 0-10VDC
19. Relay Outputs: 250VAC/6A, 30VDC/5A
20. Operator Interface: LCD Screen, 7 pushbuttons

B. The VFD shall be for wall mounting within a cabinet. Stainless Steel Legs may be required.

C. The VFD shall have an air ventilated system, with or without fan driven ventilation having a maximum ambient temperature of up to 90 degrees Fahrenheit without derating.

2.3 USER INTERACE / MENUS

A. The VFD or VFD control system shall incorporate an LCD screen to display drive operating status, alarms, liquid level and parameters. The VFD shall include 7 pushbuttons with the following functions: Pump Start, Pump Stop, Hand (Manual) Operation, Auto Operation, Menu Access, Increase Value, and Decrease Value.

B. Pump Start Level, Operating Parameter Adjustment and Alarm History shall be accessed via menu structure. Menu shall have 4 levels of security, limiting access to qualified personnel only.

C. The LCD screen shall display status information in 4 modes: Off, Standby, Active Auto and Active Manual. The information shown shall be as follows:

1. OFF: Firmware Version, Status ("OFF")
2. STANDBY: Status and Name, Pump Running Hours, Operating Mode, Sump Level
3. ACTIVE AUTO: Status and Name, Pump Running Hours, Operating Mode, Motor Freq. Power, Sump Level
4. ACTIVE MANUAL: Status and Name, Pump Running Hours, Operating Mode, Motor Freq., Power, Sump Level

D. VFD Operational Functionality

1. High/Low Level Sump Control

a. The VFD shall provide automatic level control via means of a submersible pressure transducer (4-20 mA DC). User-programmable Start Level shall indicate the point at which the pump will start. Upon activation the pump shall run at maximum speed for a pre-determined period, then ramp down to the energy efficient optimal speed, calculated by the VFD. When the water level reaches the Stop Level, the pump shall stop. The optimal speed shall either be calculated by the VFD or manually entered by the user.

b. In case of high inflow, the VFD shall increase pump speed until the water level begins to decrease. When the water level reaches the Stop Level, the pump shall stop.

c. In case of very high inflow when a single pump is unable to overcome the inflow conditions even at maximum speed, the lag pump shall be activated and run at maximum speed until the Stop Level is reached. If water levels continue to rise, a High Level Alarm shall be activated via the transducer connected to the VFD.

d. The VFD shall incorporate a minimum speed function that prevents the pump from operating at speeds too low to move water based on the pump curve and field testing.

2. Run Time Averaging

a. The VFD or VFD control system shall provide capability to balance run times for even wear. This shall be an internal function of the VFD and not require external devices, such as an alternating relay. The function shall operate by determining a "random" start level based on the Start Level setting. Each VFD shall determine its own random start level independent of each other. New random start levels will be determined every 24 hours. The pump with the lowest random start level shall

be first to start on any given pump cycle. The pump with the next to the lowest random start level (lag 1 pump) shall remain in standby capacity in case the lead pump shall not be able to lower the water level as described in the section above. The pump with the highest random start level (lag 1 pump) shall remain in standby capacity in case the lead pump is not able to lower the water level as prescribed. By recalculating the random start levels every 24 hours, balanced run times are accomplished.

3. Pump Cleaning Function

   a. The VFD or VFD control system shall incorporate a "self-cleaning" function to remove debris from the impeller. The cleaning shall be triggered by three circumstances:

      1) Soft Clogging: When motor current equals 20% or greater above rated current for a period of 7 seconds.
      2) Hard Clogging: When motor current equals 80% or greater above rated current for a period of 0.01 seconds.
      3) Schedule Cleaning: The VFD is preprogrammed to perform cleaning once every 5 days.

   b. Cleaning cycle shall consist of forced stopping, reversal and forward runs timed to allow for debris to fall from the impeller. After cleaning cycle is complete, VFD shall resume automatic operation.

4. Sump Cleaning Function

   a. The VFD or VFD Control System shall incorporate a sump cleaning function to ensure surface solids and greases are regularly removed from the sump. The sump cleaning function shall be performed once every 24 hours when enabled by the operator. Sump cleaning consists of the following functions

      1) Sump cleaning is triggered when internal timer expires and during a normal pump down cycle.
      2) Pump is automatically ramped to maximum speed
      3) Pump runs at maximum speed for designated time (default value is 2 minutes, user adjustable)
      4) When Sump Cleaning timer expires, pump is shut off and resumes normal operation

5. Pipe Cleaning Function

   a. The VFD shall incorporate a pipe cleaning function to avoid discharge pipe sedimentation and clogging due to reduced pump speed. This shall be an automatic feature that initiates with every pump cycle when enabled by the operator. Upon reaching Pump Start Level, the VFD shall operate the pump at 100% speed for a 6-8 second period (operator-adjustable) before ramping down to the most energy efficient speed for the duration of the cycle.

6. Energy Efficiency Function

a. The VFD shall provide a function that automatically calculates the most energy efficient speed for the pump based on station inflow characteristics. This shall be accomplished by means of an algorithm that records energy consumption every cycle and compares it to the previous cycle. These comparisons are then used to calculate the optimal speed whereby the most water is pumped using the least amount of energy. By continually comparing succeeding periods, the optimal speed is constantly adjusted to account for changes inflow without requiring operator adjustment, multiple set points, etc.

b. The energy efficient function will also be based on specific pump curve information that will prevent the VFD from running off of the system curve for the pump. This will ensure maximum hydraulic efficiency as well as electrical efficiency is maintained.

7. Alarms & Monitoring

a. The VFD or VFD Control System shall provide alarms and monitoring for the VFD, pump and sump. Alarms shall be presented on the LCD display, via a Summary Alarm relay and via Modbus registers. All alarms, when occurring, shall remain active until reset. Alarms shall have a built-in 4 second delay to prevent nuisance tripping. Alarms shall be as follows:

1) Pump Monitoring:

a) Pump Over Temperature (thermal contacts in motor stator)
b) Pump Seal Leak

2) Sump Monitoring:

a) High Sump Level (via level float switch or submersible transducer)
b) Sensor Error (High Level float switch active while submersible transducer reports water level below Start Level)

3) VFD Monitoring (includes, but not limited to):

a) Drive Overcurrent
b) Drive Overload Trip
c) Drive Overvoltage
d) Drive Undervoltage
e) Drive Overtemperature (internal)
f) Drive Overtemperature (ambient)
g) Drive Undertemperature (ambient)
h) External Trip (E-Stop)
i) Input Phase Loss
j) Drive Output Max Torque Exceeded

8. External Communication

a. The VFDs shall include a provision for external communication to a higher-level system. Communication shall be via 2-wire RS-485 connection to the VFD. Communication shall be available as MODBUS RTU.

b. Serial communication capabilities shall include, but not be limited to set Start and Stop Level, pump clean interval, speed and ramp times, as well as level control parameters.
c. The communication telegram shall include process variable feedback like sump level, power (kW), output speed/frequency, current (A), percent torque, relay outputs, digital inputs, and drive status and fault information.

PART 3 - EXECUTION

A. INSTALLATION
1. Install VFDs according to manufacturer recommendations and as shown in the Drawings.

B. START-UP

1. Start-up shall be provided for each VFD by a factory authorized service professional. A start-up form shall be filled out for each drive with a copy provided to the owner, and a copy kept on file at the manufacturer.

C. PRODUCT SUPPORT

1. Factory trained service personnel that are trained on the VFD products offered shall be locally available at both the specifying and installation locations.
2. A toll free 24/365 technical support line connected to factory support personnel located in the US shall be available. Technical support offered only through the local sales office is not acceptable.
3. Training shall include installation, programming and operation of the VFD, and serial communication. Factory authorized start up and owner training to be provided locally upon request.

D. WARRANTY

1. The VFD Product Warranty shall be 24 months from the date of manufacture. A 36 month warranty shall be available with authorized factory start up and drive registration. The warranty shall include all parts, labor, travel time and expenses. A toll free 24/365 technical support line shall be available.
2. Extended Warranty shall be available for purchase for up to 72 months from date of manufacture.

END OF SECTION 432700

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SECTION 461216 – GRIT REMOVAL EQUIPMENT

PART 1- GENERAL

1.1 SCOPE

A. Supply all labor, materials, equipment and incidentals required to install and place into operation the fine screening system as shown on the Drawings and as specified herein.

1.2 REFERENCE STANDARDS

A. The properties of all materials, design, fabrication and performance of the equipment to be furnished under this section shall be in accordance with the latest issue of applicable standard specifications. The governing authorities of these standards are listed below.

1. AICS, American Institute of Steel Construction
2. AISI American Iron and Steel Institute
3. ANSI, American National Standards Institute
4. ASCE, American Society of Civil Engineers
5. ASME, American Society of Mechanical Engineers
6. ASTM, American Society of Testing and Materials
7. AWS, American Welding Society
8. IBC, International Building Code
9. IEC, International Electric Code
10. IEEE, Institute of Electrical and Electronics Engineers
11. NEC, National Electrical Code
12. NEMA, National Electrical Manufacturers Association
13. Underwriters Laboratory (UL and cUL)

1.3 SUBMITTALS

A. Section 013300 - Submittal Procedures: Requirements for submittals.

B. Submittals shall be provided to the engineer that includes all the following information:

1. Certified shop drawings showing all important details of construction, dimensions and anchor bolt locations.
2. Descriptive product literature.
3. Schematic electrical wiring diagram and electrical controls information.
4. Complete motor and drive data.
5. The total weight of the equipment.
6. A complete bill of materials of all equipment.

C. A copy of this specification section and all referenced and applicable sections, with addendum updates included and with each paragraph check-marked to indicate specification compliance or marked to indicate requested deviations from specification requirements is required under this section. Check marks (✓) shall denote full compliance with a paragraph as a whole. If deviations from the specifications are indicated, and therefore requested by the Contractor, each deviation shall be underlined and denoted by a number in the margin to the right of the identified paragraph, referenced to a detailed written explanation of the reasons for requesting the devia-

tion. The Engineer shall be the final authority for determining acceptability of requested deviations. The remaining portions of the

paragraph not underlined will signify compliance on the part of the Contractor with the specifications. Failure to include a copy of the marked-up specification sections, along with justification(s) for any requested deviations to the specification requirements, with the submittal shall be sufficient cause for rejection of the entire submittal with no further consideration.

1.4 QUALITY ASSURANCE

A. Single Source Responsibility: To ensure that all equipment required for the installation of the grit removal equipment and controls is properly coordinated and will function as a unit in accordance with the intent of these specifications, the Contractor shall obtain all the equipment specified under this Section, from a single supplier in whom the responsibility for the proper function of all the equipment, regardless of manufacturer, as an integrated and coordinated system shall be vested. The intent of this paragraph is to establish unit responsibility for all the equipment with the screening equipment supplier. The use of the work "responsibility" relating to the equipment supplier is in no way intended to relieve the Contractor's ultimate responsibility for equipment coordination, installation, operation, and guarantee.

B. All the equipment specified under this Section shall be supplied by a single manufacturer involved in the manufacture of the grit removal equipment. Qualified manufacturers shall have a minimum of ten (10) years' experience with wastewater screening systems, specifically including through flow continuous belt screens and Washing Compactors, for consideration.

C. If equipment is not manufactured by supplier, including welding and machining, the name and contact information of manufacturing facility must be supplied. If more than one manufacturer is used all companies and facilities must be provided.

D. If patents protecting equipment are not owned by supplier then an affidavit must be supplied stating owner of design and expiration of licensing agreement.

E. The equipment shall be the trap Classifier, Grit Pump and the Grit Classifier as provided by Hydro-Dyne Engineering, Inc., Oldsmar, FL. Other than the named supplier, all manufacturers proposing equipment described herein, will provide a detailed submittal package, which will consist, at a minimum, of all information and details prescribed in section 2.2 of this specification. All pre-qualification submittals will be submitted to the Engineer at least 15 days prior to the bid date.

F. If submitted equipment requires arrangement differing from that specified, prepare and submit for review complete structural, mechanical, and electrical drawings and equipment lists showing all necessary changes and embodying all special features of equipment proposed. Any changes are at no additional compensation and the Manufacturer will be responsible for all engineering costs of redesign by the Engineer, if necessary.

1.5 DESIGN REQUIREMENTS – VORTEX COLLECTOR

A. System Description

1. The Grit Trap will be a "vortex" style system designed to operate continuously.

2. The internal rotating mechanism will be installed into the circular concrete chamber as shown on the contract drawings. The chamber will consist of an upper separation chamber and a lower collection hopper.

3. The wastewater flow will enter the chamber tangentially, flow around the upper separation chamber and exit via an outlet channel running parallel to the inlet.

4. The grit solids will fall through the upper separation chamber to settle in the lower collection hopper. The transfer airlift pump will regularly cycle and transport the grit particles to the de-watering Grit Classifier.

5. Consistent performance of the grit chamber throughout the flow ranges will be maintained by the motor driven impeller that continuously rotates within the upper separation chamber. The device will provide the ideal conditions to enhance grit settlement and maximize the ejection of light organic solids from the chamber.

6. The floor of the upper separation chamber must be sloped as shown on the contract drawings to prevent grit accumulation and allow the grit to fall by gravity into the collection hopper.

7. All stainless steel (including drive tube, impeller and hardware) mentioned below as stainless steel shall be T304stainless steel. All hardware shall be T316 stainless steel.

B. System Performance - The Grit Trap will be designed to meet the following grit removal performance guarantee at all flows up to and including the peak flow:

1.	Grit greater than 50 mesh	95%
2.	Grit greater than 70 mesh but not less than 50 mesh	85%
3.	Grit greater than 100 mesh but not less than 70 mesh	65%

C. The Grit Trap model will be selected to meet the following design parameters:

1.	Number of chambers required	1
2.	Peak flow per chamber	6.0 MGD
3.	Maximum allowable head loss at peak flow	¼ inches
4.	Average flow	1.2 MGD

1.6 DESIGN REQUIREMENTS – GRIT PUMP

A. System Description

1. The manufacturer shall supply a grit pump to transfer the grit and liquid from the collection hopper to the grit screw classifier system. Grit pump shall be a Gorman Rupp T4A718-B vertical belt base, or equal.

2. The grit pump shall be top mounted as shown on the Drawings.

3. The contractor shall supply the interconnecting 4 inch pipe from the top of the suction pipe to the grit pump inlet and the grit pump outlet to the grit screw classifier.

4. System Performance – The grit pump will fully comply with the following criteria

   a. Number of grit pumps 1
   b. Maximum pump capacity 250 GPM
   c. Inlet connection 4 inches
   d. Outlet connection 4 inches

1.7 DESIGN REQUIREMENTS – GRIT CLASSIFIER SYSTEM

A. System Description

1. The Grit Classifier system will be adequately sized to receive and process a mixture of grit and liquid regularly pumped at the maximum specified rate from the vortex grit chamber.

2. A cyclone, mounted on top of the Grit Classifier will provide initial dewatering. The excess liquid will be immediately returned to the main flow.

3. The partially dewatered grit will be deposited into the main body of the Grit Classifier. The heavy grit will settle in the collection hopper while the excess liquid will overflow an internal weir and be returned to the main flow.

4. The grit will be elevated by a rotating screw to a discharge point above the internal water level. By this time the grit material will be free of any free standing liquid.

5. All stainless steel (including Grit Classifier, grit cyclone and hardware) mentioned below as stainless steel shall be T304 stainless steel.

B. System Performance – The Grit Classifier system will fully comply with the following criteria:

1. Number of cyclones 1
2. Maximum capacity of cyclone 250 GPM
3. Inlet flanged spool piece construction 4 inches
4. Overflow flanged spool piece connection 6 inches
5. Maximum underflow to screw classifier 50 GPM Maximum
6. Number of screw classifiers 1
7. Maximum capacity of screw classifier 100 GPM
8. Diameter of screw 9 inches
9. Diameter of screw shaft 3 ½ inches
10. Minimum length of screw 12 feet
11. Speed of screw 15 RPM
12. Motor Size 1 HP

1.8 WARRANTY

A. The Manufacturer of the equipment supplied under this specification shall provide a warranty for a period of twelve (12) months commencing on the date of Substantial Completion. The Manufacturer shall guarantee that the equipment furnished is suitable for the purpose intended and free from defects in design, materials and workmanship. In the event that the equipment fails to perform as specified the Manufacturer shall, at his option, promptly repair, modify or replace the defective equipment.

Part 2 - PRODUCTS

2.1 MANUFACTURER

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to the following:

1. Hydro-Dyne Engineering, Inc.

2. Ovivo, J+A

3. SAVECO

2.2 THE VORTEX GRIT TRAP

B. General

1. The internal mechanism of the Grit Trap will consist of a helical gear motor, a drive head, a drive tube and a rotating impeller.

2. The grit chamber shall be a concrete structure, provided by the contractor that must have inlet and outlet channels as shown on the Drawings.

C. The Drive Head Assembly

1. The drive head will be a composite unit consisting of a heavy duty steel base and cover. The base section will support a nominal 20 inch turntable bearing that has a minimum B-10 life of 20 years. The Contractor will be responsible for correctly mounting the drive head on the bridge.

2. The drive tube will be rotated at a nominal 15 RPM by a heavy duty spur tooth bull gear wheel securely bolted to the turntable bearing. This bull gear wheel will be driven by a steel drive pinion mounted on the output shaft of the helical gear motor. The helical gear motor will be supported by a cover that will have an access port to allow the contractor to check that the gear wheel and pinion are centered correctly. The pinion and the bull gear will have a service factor of 5.0 or greater at standard operating speeds.

3. The helical gear motor will be directly shaft mounted to the bull gear wheel. Each drive head will have a single 3/4 hp, continuous duty electric motor suitable for a 460/3/60 supply and rated for a Class 1 Div. 2 environment. As a minimum, the motor will be TEFC with and IP55 enclosure rating will conform to NEMA MG-1 requirements.

4. The whole drive head assembly will be suitable for continuous operation.

D. The Rotating Mechanism

1. The drive tube will be 10.75 inch diameter pipe that will run down the center of the grit chamber. The drive tube will pass through an opening in bull gear wheel and terminate inside the drive head as an open pipe.

2. The impeller will be attached to the drive tube by means of a two piece collar. The impeller shall have four equally spaced blades fixed to a base plate. As the impeller rotates each blade will pass within 6 inches from the top of the collection hopper. The impeller blades will be set at 5 to 20 degrees to the vertical. The profile of the impeller blades will be designed to maximize grit capture and eject floating solids out of the chamber. The impeller will rotate at a nominal 15 RPM in the direction to the waste water flow.

3. The rotating mechanism will be manufactured from stainless steel.

2.3 THE GRIT PUMP – TOP MOUNTED

A. General

1. The grit pump suction arrangement will consist of a 4-inch diameter suction pipe and a parallel 1.5-inch fluidizing pipe that will run down the middle of the drive tube to within 4-inches off the bottom of the grit collection hopper floor. Both pipes will terminate immediately above the drive head. The manufacturer will supply 1.5-inch solenoid valve and two manual PVC isolation valves that the Contractor will install at a convenient place in the fluidizing pipe above the drive head. The Contractor will bring and connect an air to water supply to the 1.5-inch pipe that will provide agitation of the grit before each pumping cycle.

2. The grit pump suction assembly will be manufactured from stainless steel.

3. The Contractor will connect the fluidizing pipe to a water supply that will deliver a minimum pressure of 40 psig at the suction point. This will provide a blast of water that will agitate the grit prior to each pumping cycle.

4. The manufacturer will control the solenoid valve and hence the fluidizing cycle through the control panel specified in 2.5.

5. The Contractor will supply the pipe to the flanged connection of the center mounted 4" suction pipe that terminates above the drive head to the inlet of the grit pump.

6. The Contractor will supply the 4" pipe from the outlet of the grit pump to the dewatering screw classifier.

7. The grit pump shall be designed to handle the passage of 3" spherical solids.

B. Grit Pump Design

1. The foot supported pump casing will be designed to retain sufficient liquid for automatic re-priming between pumping cycles. It will allow a horizontal centerline section and vertical discharge arrangement and incorporate a fill port with safety lock bar and Teflon gasket. A drain hole will be provided for connection to the drain kit. The kit shall contain 10' length of reinforced plastic hose with a female quick connect fitting at one end, and factory installed drain fittings in each pump. Fittings include stainless steel pipe nipple, stainless steel bushing, stainless steel ball valve and aluminum male quick connect fitting.

2. A separate capped threaded port will be provided for the casing heater. If required thermostat control will be provided the main control panel.

3. The cover plate will be supplied with a removable wear liner. It will be sealed to the pump casing by two Buna-N O-rings. The cover plate also has a pressure relief valve to open at 75 PSI fitted with a handle pusher bolt capability.

4. The two vane impeller will be a semi open, non-clog design that has integral pump-out vanes on the back shroud. The impeller will be threaded on to the pump shaft and secured with a lock screw.

4. The shaft bearings will be anti-friction ball or tapered roller type that will withstand loads associated with normal operation. A mechanical cartridge seal will seal the pump shaft against leakage. This seal will be double floating to prevent misalignment that might arise from

   vibration, deflection or general movement.

6. Separate oil filled cavities, vented to the atmosphere will be provided for the shaft seal and bearings. The cavities will be cooled by the pumped liquid. The bearing and seal cavities will have an oil level sight gauge and fill plug with vent. The oil will be prevented from leaking by a three lip seal arrangement.

C. Grit Pump Drive Motor

1. The motor shall be 5 hp, suitable for 460 volts, 3-phase, and 60 Hz and rated for a Class 1 Div.2 environment. As a minimum, the motor will be TEFC with an IP55 enclosure rating and will conform to NEMA MG-1 requirements.

2. The V-belt transmission will transfer the power from the motor to the pump. The V-belt will have two belts and safety factor of 1.5. The drive transmission will be supplied with removable guards with openings less than ½ an inch.

D. Grit Pump Construction

1. The materials of construction will be as follows:

   - Casing– Gray Iron No. 30
   - Suction flap – molded neoprene with steel reinforcement
   - Cover plate – Iron 30 with replaceable hardened steel wear plate
   - Impeller – Cast ADI (Austempered Ductile Iron) with minimum Brinell hardness of 400.
   - Pump shaft – Alloy steel No. 1440
   - Shaft sleeve – Alloy steel No. 1430
   - Mechanical seal mating faces – Tungsten Titanium Carbide
   - Replaceable seal plate - ADI (Austempered Ductile Iron) with minimum Brinell hardness of 400.

E. Grit Pump Volute Heater

1. Grit pump shall be equipped with a 500 watt volute heater and thermostat kit. The equipment manufacturer shall provide a step down transformer that delivers single phase 120V power supply installed inside or adjacent to the control panel.

2.4 THE GRIT CLASSIFIER SYSTEM

A. The Grit Cyclone

1. The grit pump will pump the grit mixture directly to a flanged inlet connection situated on the side of the cyclone through a 4 inch pipe, supplied by the contractor. The cyclone will be mounted on a support beam placed over the inlet hopper of the grit classifier.

2. The cyclone will be capable of receiving and processing pumped flow up to a maximum of 250 GPM. The excess water will be separated and returned to the main flow via a 6 inch flanged outlet connection situated on the top of the casing. The contractor will supply and install the return pipe with siphon break. The remaining concentrated grit mixture will be removed and directed via cone and apex into Grit Classifier's inlet hopper. The apex will have a fixed neoprene rubber liner and include quick release toggle clamps.

3. The cyclone will work on the constant vortex principle and have no moving parts. Pressure must be maintained above 5 psi.

4. The cyclone casing will be manufactured from ¼ inch thick 304 Stainless steel plate. It shall be constructed with access to easily remove and replace the internal wear liner.

5. The inlet adapter will include a 1.25" pressure gauge connection and the manufacturer shall supply a pressure gauge assembly complete with protective diaphragm, 0-30 PSI dial.

6. Cyclones must be painted to FL Smidth Krebs EN-SPEC-4-3041.

B. The Grit Classifier

1. The partially de-watered grit mixture will be pumped into the main body of the Grit Classifier. The main body is comprised of an inlet hopper and a screw trough that will be manufactured from stainless steel plate.

2. The inlet hopper will have sloping side walls and a minimum internal surface area of $25ft^2$. The design will guarantee retention of 95% of 100 micron grit particles at the maximum inflow of 100 GPM without added internal baffle plates.

3. The grit particles will settle on the bottom of the inlet hopper. The excess liquid will spill over an internal weir within the inlet hopper and be returned to the sewage flow. The manufacturer will terminate with a flanged 6 inch pipe connection within 12 inches of the main body of the Grit Classifier.

5. The retained grit particles will be elevated from the inlet hopper by a rotating screw that runs the full length of the Grit Classifier. The full pitch screw will be installed at a nominal 25 degree angle.

6. The screw assembly will move the grit particles from the submerged inlet hopper to the "drying zone" section of the screw trough. The length of the "drying zone" must be no less than 6 feet to ensure adequate de-watering. The dry grit will discharge from a circular outlet at the end of the screw trough and be directed into the dumpster (supplied by others).

7. The screw assembly will be supported within the main body by a top and bottom bearing arrangement specially designed to avoid premature wear by abrasive grit particles. The bearing arrangement must support the entire length of the screw and maintain a ½ inch nominal clearance between the screw flights and the full length of the Grit Classifier main body. This will allow a permanent grit layer to accumulate and act as a natural wear liner protection.

8. The top bearing shall be a UHMWPE radial and thrust and washer bearing.

9. The bottom bearing shall be mounted externally to the main body of the classifier.

10. The lower bearing will consist of a (4) bolt flanged ball bearing surrounding a drive shaft seal that is external to the hopper. The drive shaft seal is grease pressurized with a grease purged shaft seal inside a UHMWPE bushing and thrust washer.

11. The lower bearing will have a grit rejection device in the form of a spring loaded automatic grease dispensers

12. The entire Screw Classifier will be provided complete with the support legs suitable for mounting directly to the concrete floor.

13. The manufacturer shall provide lightweight expanded minimum 16 gauge stainless steel covers that are easily removed for maintenance.

14. The manufacturer shall provide an ESTOP on the side of the collection hopper that is easily accessible for the operator.

15. The motor shall be 1 hp continuous duty electric motor suitable for a 460/3/60 supply and rated for a Class 1 Div. 2 environment. As a minimum, the motor will be TEFC with IP55 enclosure rating and will conform to NEMA MG-1 requirements.

2.5 THE CONTROL PANEL

A. General Information - The manufacturer will supply one UL listed 508A stainless steel main control panel and one local panel that shall automatically control the equipment offered in this section.

B. The Main Control Panel – NEMA 4X – Each control panel shall consist of the following components for each grit removal system:

1. Stainless steel NEMA 4X, control panel enclosure
2. Main disconnect / door handle
3. Motor starters, non-reversing, IEC w/ overload [Grit Impeller, Grit Pump & Grit Classifi-

er]
4. Current monitor [Grit Classifier]
5. Hour meters
6. Control power transformer, 480-120VAC, w/branch circuit fuses
7. Circuit for 500 Watt for grit pump volute heater
8. 24 Hour time clock
9. Timers
10. Pushbuttons: [E-Stop and Reset]
11. Selector switches: [Vortex Off-On, Grit System H-O-A]
12. Pilot lights, transformer type: [Control Power, Run and Fault per motor, Fluidizing SV Open]
13. 1 Lot, socket type, control relays
14. 1 Lot, terminal blocks
15. Remote contacts: [System Run and System Fault]

C. Three (3) Local Control Panels – NEMA 4X - Each local control panel shall consist of the following components:

1. Hand/Off/Auto switch
2. Emergency stop

D. Sequence of operation and control:

1. The Grit Trap will run continuously.
2. The grit pump can be controlled manually but will normally operate automatically in timed on/off adjustable cycles as selected.
3. In automatic mode the grit pump cycle will be initiated by a 24 hour time clock.
4. The grit agitation cycle will start (0-5 minutes) and then stops.
5. The grit pump and screw classifier will then start immediately (0-10 minutes).
6. The signal is received to stop and the grit pump stops immediately.
7. The Screw Classifier initiates a run on cycle (0-5 minutes) and then stops.
8. End of cycle.

E. SCADA System Interface

1. The control system shall provide dedicated terminations for connection to the SCADA system inputs. Digital contacts shall be relay isolated dry contacts. Analog outputs shall be isolated 4-20 mA.

a. DI-1 Grit Drive Fault
b. DI-2 Grit Classifier Fault
c. DI-3 Grit Pump Fault

2.6 SURFACE PREPARATION AND PAINTING

A. All stainless steel materials, including hardware, shall be acid passivated for quality control, removal of heat affected discoloration, surface treatment for corrosive environments and to provide a uniform finish to stainless surfaces.

B. All ferrous surfaces (except stainless steel) shall be coated with a pre-primer, primer, and an exterior top coating, or fusion bonded polyester coating suitable for humid/wet environments for superior corrosion protection.

C. Motor and gearbox shall be manufacturer's standard coating for humid/wet environments for superior corrosion protection.

2.7 SPARE PARTS

A. The manufacturer will supply the following spare parts:

1. One (1) Pump mechanical seal.
2. Required pump cover plate O-Ring(s).
3. One (1) rotating assembly O-Ring(s).
4. One (1) set of impeller clearance adjustments spacers.
5. One (1) set of spare V-Belts.

2.8 ACCESSORIES

A. The manufacturer will supply the following accessories with the equipment:

1. One (1) explosion proof brass body solenoid valve.
2. One (1) 1" manual isolation valve.
3. One (1) 1" full port valve.
4. Two (2) spring loaded auto greasers.

PART 3 – EXECUTION

3.1 FACTORY TESTING

A. The grit removal system and all components shall be factory assembled and tested for a minimum of 24 hours prior to shipment. The equipment shall be shipped fully assembled and shall be capable of being set in place and field erected by the Contractor with minimal field assembly.

B. During the factory test period the grit removal system shall be adjusted as required assuring proper operation on completion of the field installation. The Manufacturer shall supply a certification of the completion of the factory testing of the assembled grit removal system and appurtenances and shall certify as to the equipment being in satisfactory operating condition at time of shipment. The Engineer and/or Owner may, at their own option and expense, witness the factory test.

3.2 DELIVERY AND STORAGE

A. The grit removal system shall be appropriately crated and delivered to protect against damage during shipment.

B. An authorized representative of the Contractor shall inspect the grit equipment on delivery to the jobsite and shall report any damage or missing components to the Manufacturer and the Engineer within 72 hours of receipt of the shipment.

3.3 INSTALLATION

A. The installation of the equipment shall be as indicated on the drawings and in strict accordance with the Manufacturer's instructions and recommendations.

3.4 FIELD TESTS, ADJUSTMENTS AND COMMISSIONING

A. The equipment shall be shipped completely factory assembled. Contractor shall verify all access dimensions, channel dimensions, and any interior building dimensions to ensure equipment may be installed as a factory assembled units.

B. After completion of the installation, the equipment shall be inspected and certified by an authorized representative of the Manufacturer as being in compliance with the Manufacturer's recommendations and requirements. At such time as the Manufacturer has deemed the installation to be acceptable, the Manufacturer's authorized service representative shall make any required adjustments and shall start the equipment to assure proper operation.

C. The Manufacturer's authorized representative shall provide instruction to the plant personnel as to the operation and maintenance of the equipment including commissioning, shut down, on-line operations, lubrication and preventative maintenance.

D. Manufacturer shall state field service rates for a Service Engineer to Owner and Contractor. In the event that the field service time required by this section should not be sufficient to properly place the equipment into operation, and the requirement for additional time is beyond the manufacturer's responsibility, additional time shall be purchased by Contractor to correct deficiencies in installation, equipment, or material without additional cost to Owner.

E. The Contractor shall include in his bid, the cost of the above referenced authorized service representative for a minimum of one (1) eight hour day onsite to complete the certifications and training described in this specification section.

3.5 PERFORMANCE GUARANTEE

A. The grit removal equipment shall be tested at the normal plant operating conditions and shall provide results equal to or greater than specified herein.

END OF SECTION 461216

SECTION 461320 – NON-POTABLE WATER PACKAGED PUMPING SYSTEM

PART 1 - GENERAL

1.1 GENERAL

A. Furnish (and install) a unit built in accordance with the Hydraulic Institute Standards. Non-Potable Water Packaged Pumping System Pump(s) and Specified Accessories.

1.2 REFERENCE STANDARDS

A. The work in this section is subject to the requirements of applicable portions of the following standards:

1. Hydraulic Institute
2. ANSI – American National Standards Institute
3. ASTM – American Society for Testing and Materials
4. IEEE – Institute of Electrical and Electronics Engineers
5. NEMA – National Electrical Manufacturers Association
6. NEC – National Electrical Code
7. ISO – International Standards Organization
8. UL – Underwriters Laboratories, Inc.

1.3 SUBMITTALS

A. A copy of this specification section and all referenced and applicable sections, with addendum updates included and with each paragraph check-marked to indicate specification compliance or marked to indicate requested deviations from specification requirements is required under this section. Check marks (□) shall denote full compliance with a paragraph as a whole. If deviations from the specifications are indicated, and therefore requested by the Contractor, each deviation shall be underlined and denoted by a number in the margin to the right of the identified paragraph, referenced to a detailed written explanation of the reasons for requesting the deviation. The Engineer shall be the final authority for determining acceptability of requested deviations. The remaining portions of the paragraph not underlined will signify compliance on the part of the Contractor with the specifications. Failure to include a copy of the marked-up specification sections, along with justification(s) for any requested deviations to the specification requirements, with the submittal shall be sufficient cause for rejection of the entire submittal with no further consideration

B. Product Data

1. Prior to fabrication, packaged pump system manufacturer shall submit 6 printed copies and 1 copy on electronic media of submittal data for review and approval.

2. Submittal shall include shop drawings, electrical ladder logic drawings, and support data as follows: Catalog cut sheets reflecting characteristics for major items of equipment, materials of construction, layout drawings of the door and back plane, major dimensions, motor and v-belt drive data, pump characteristic curves showing the design duty point capacity (GPM), head (FT), net positive suction head required (NPSHr), and hydraulic brake horsepower (BHP). Electrical components used in the motor branch and liquid level control shall be fully described.

3. Shop drawings shall provide layout of mechanical equipment and anchor bolt locations for station. Pipe penetrations and station access clearances shall be dimensioned relative to the station centerline. The electrical ladder logic drawings shall illustrate motor branch and flow control circuits to extent necessary to validate function and integration of circuits to form a complete working system.

C. Operations and Maintenance Manuals

1. Operation shall be in accordance with written instructions provided by the packaged pump system manufacturer. Comprehensive instructions supplied at time of shipment shall enable personnel to properly operate and maintain all equipment supplied. Content and instructions shall assume operating personnel are familiar with pumps, motors, piping and valves, but lack experience on exact equipment supplied.

2. Documentation shall be specific to the packaged pump system supplied and collated in functional sections. Each section shall combine to form a complete system manual covering all aspects of equipment supplied by the station manufacturer. Support data for any equipment supplied by others, even if mounted or included in overall station design, shall be provided by those supplying the equipment. Instructions shall include the following as a minimum:

   a. Functional description of each major component, complete with operating instructions.

   b. Instructions for operating pumps and pump controls in all modes of operation.

   c. Calibration and adjustment of equipment for initial start-up, replacement of level control components, or as required for routine maintenance.

   d. Support data for commercially available components not produced by the station manufacturer, but supplied in accordance with the specifications, shall be supported by literature from the prime manufacturer and incorporated as appendices.

   e. Electrical schematic diagram of the packaged pump system circuits shall be in accordance with NFPA 79. Schematics shall illustrate, to the extent of authorized repair, pump motor branch, control and alarm system circuits including interconnections. Wire numbers and legend symbols shall be shown. Schematic diagrams for individual components, not normally repairable by the station operator, need not be included. Details for such parts shall not be substituted for an overall system schematic. Partial schematics, block diagrams, and simplified schematics shall not be provided in lieu of an overall system diagram.

f. Mechanical layout drawing of the control panel and the packaged pump system and components, prepared in accordance with good commercial practice, shall provide installation dimensions and location of all pumps, motors, valves and piping.

3. Operation and maintenance instructions which rely on vendor cut-sheets and literature which include general configurations, or require operating personnel to selectively read portions of the manual shall not be acceptable. Operation and maintenance instructions must be specific to equipment supplied in accordance with these specifications.

1.4 WARRANTY

A. The warranty period shall be a non-prorated period of 24 months from date of certified start-up.

PART 2 - PRODUCTS

2.1 GENERAL

A. All products shall be provided by one vendor/supplier as a complete package.

2.2 PUMPS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include but are not limited to the following:

1. Crane Deming
2. Engineer's approved equal.

B. Horizontal Splitcase Double Suction Single stage Centrifugal Pumps:

1. Description: Factory-assembled and field-tested pump unit.

a. Each pump shall be capable of pumping 155 US gpm when operating against a total pumping head of 210' ft tdh
b. The pump shall operate at 3500 rpm and shall have 65 percent minimum guaranteed efficiency at the design point.
c. Shut off head shall be counter-clockwise rotation when viewed from behind the driver end
d. All castings shall be free of warp, fins, gas and pit holes, and other defects that might impair strength or appearance.
e. All welding shall be in accordance with the standards of the AWS.

2. Pump Casing: Extra heavy cast iron, ductile iron, or bronze with minimum tensile strength of 30,000 lbs and shall be split parallel to the shaft.

a. Bearing housing supports, suction and discharge flanges shall be cast, bored and machined integrally with the lower half casing.

1) Upper and lower half casings shall be dowelled and bolted together.

b. All steel shall conform to the applicable ASTM standard

c. Provide the casing with a replaceable wearing ring.

3. Impeller: One-piece cast iron or equivalent, double suction type, accurately machined and balanced to minimize thrust.

   a. Shall be keyed and axially adjusted on the shaft by means of threaded shaft sleeves.

   b. Provide with replaceable impeller wear ring constructed of stainless steel dissimilar to casing wear ring.

4. Pump and Motor Shaft: Protected by renewable bronze, 440C, or 316 stainless steel shaft sleeves that are threaded and tighten with shaft rotation and are free to expand at the stuffing box end.

   a. Flexible shaft coupling shall be furnished to connect the driver to the pump

5. Seals: Mechanical.

   1) Coupling shall be enclosed in standard coupling guard

6. Motor: 15 HP, 3600rpm, NEMA Design B squirrel case induction type, open drip-proof motor with 1.15 service factor.

   a. Suitable for operation on 230/460 volt, 3-phase, 60 hertz power upply.

   b. Hermetically sealed, capacitor-start type; built-in overload protection; lifting eye or lug.

7. Controls: Wall-mounted, NEMA 250; automatic alternator; high water alarm.

2.3 VARIABLE FREQUENCY DRIVES

A. Available Manufacturers: The manufacturer of the VFD's shall have minimum 5 years' experience in the design and manufacture of Variable Frequency Drives (VFDs). The VFD and all associated equipment shall be UL Listed according to UL 508C – Power Conversion Equipment. As verification, a UL label shall be attached on the enclosure. The VFD shall be UL approved for mounting in plenums and compartments handling conditioned air. The VFD shall be designed, constructed and tested in accordance with UL, CSA, NEMA, and NEC standards. Every power converter shall be tested with an AC induction motor while loaded and temperature cycled within an environment chamber.

   1. Allen-Bradley
   2. Engineer's approved equal

B. The contractor shall furnish and install two (2) Variable Frequency Drive (VFD) units for controlling/starting the operation of the booster pump to maintain a selected pressure setpoint from the PLC panel. The units shall be wall mounted at the location shown on the drawings. Power and protection to each VFD shall be fed from the wall mounted NEMA 1 enclosed molded case circuit breakers, sized to adequately serve and protect the pump motors at the specified horsepower and voltage.

C. The VFD shall convert the input AC main power to an adjustable frequency and voltage as defined in the following sections. The VFD shall be listed and labeled as a complete unit and shall include all accessories and requirements as described in this section.

D. Environmental requirements for the VFD units shall be as follows:

1. Storage ambient temperature range: -40 to 85°C (-40 to 185°F).
2. Ambient temperature operating range: -10 to 45°C (14 to 113°F).
3. Relative humidity range: 5% to 95%, non-condensing.
4. Operating elevation: 1000 Meters (3,300ft).
5. Shock: 15G peak for 11ms duration.
6. Vibration: 0.152 mm (0.006 inches) displacement, 1G peak.
7. Seismic: The AC drive shall meet the seismic requirements of the 2003 International Building Code as specified by AC156.

E. The AC drives shall be sized to operate the following AC motors:

1. Booster Pumps

a. Motor horsepower - 15.
b. Motor full load ampere - 21.
c. Motor rpm will be 3600 at 60Hz.
d. Motor voltage will be 460 VAC.
e. Incoming power service to VFD's is 460 volt 3 phase.
f. VFD amp rating to be 2.85 times higher than the motor FLA.
g. Motor service factor will be 1.15.

F. The AC drive shall be sized to operate a variable torque load. The speed range shall be from a minimum speed of 1.0 Hz to a maximum speed of 60 Hz. The VFD shall be rated IP30/NEMA 1/UL Type 1. Conduit knockouts shall be provided for bottom cable entry. All VFDs shall be wall mountable.

G. The VFD shall be designed to operate from an input voltage of 460V AC ±10%, and AC frequency of 60Hz ±5%. Current overload rating shall be 110% of rated current for 60 seconds, with starting torque of 150% at 1 Hz and speed regulation of 2%.

H. The VFD shall be protected against short circuits, between output phases and to ground. The VFD shall have under-voltage and over-voltage protection. The VFD shall provide class 10 motor overload protection investigated by UL, to comply with N.E.C. Article 430. The VFD shall be able to sense a loss of load and signal a fault. If the input analog reference is lost, this shall cause a warning to be issued and the user shall have the option of pre-selecting either (1) stopping and displaying the fault, (2) running at programmable preset speed, or (3) running at min or max frequency. Upon VFD fault, drive shall store the DC bus voltage, out current and output frequency in readable parameters.

I. Process PID Control shall contain PID regulator as a standard in the VFD. This allows a pressure or flow signal to be connected to the VFD for closed loop control. The PID setpoint shall be adjustable from the Programming Terminal, Analog Inputs or Communication Networks.

J. The VFD shall have at minimum (3) programmable set points that lock out continuous operation at frequencies, which may produce mechanical resonance. The setpoints shall have an adjustable bandwidth. The VFD shall be capable of determining the speed and direction of a spinning motor and adjust its output to "pick-up" the motor at the rotating speed.

K. The VFD shall have a programmable restart function to automatically restart the equipment after restoration of power after an outage. A maintained 2-wire start input shall be necessary for this function.

L. The VFD shall have the capability to use an analog input or PID output as a start – stop command. This input can be a separate input or also used as the speed reference. Signal level below the "sleep" level acts as a Stop Command and a signal level above the "Wake" level acts as a Start Command. Sleep / Wake time and level shall be programmable. The VFD shall have the capability to attempt (9) restarts following a fault condition before locking out and requiring manual intervention. The time between restarts shall be adjustable.

M. Damper interlock can be wired directly into the drive to disable the drive output until desired damper position is obtained, even with a valid run command.

N. The VFD shall include an integral programming terminal. The programming terminal shall have at minimum a 2 line by 16 character LCD display with LED backlight. Digital speed control buttons shall be provided. Potentiometers are not acceptable. Programmable Hand-Off-Auto buttons shall be provided to toggle both start and frequency control or only the frequency control to and from the programming terminal. Text support in multiple languages, including but not limited to English, German, French, Italian, Spanish, Portuguese and Dutch.

O. Control inputs/outputs shall be as follows:

1. Analog Inputs:

    a. (1) Optically isolated analog input (-10 to 10V or 0 to 20mA), user selectable.
    b. (1) Non-isolated analog input (0 to 10V or 0 to 20mA), user selectable.
    c. Analog I/O must have 10 bit resolution or better.
    d. Both analog inputs and outputs should be able to be used simultaneously in either voltage or current modes or a combination of each.

2. Analog Outputs:

    a. (2) Analog outputs (0 to 10V or 0 to 20mA), user selectable.
    b. Analog I/O must have 8 bit resolution or better.
    c. Both analog outputs should be able to be used simultaneously in either voltage or current modes or a combination of each.

3. Digital Inputs:

    a. (7) Digital inputs (24V DC), user programmable.
    b. Inputs must be configurable as sink or source.
    c. The VFD shall have a dedicated digital input for a Purge function. The Purge input shall override all "Stop" commands over the network as well as (1) Customer Interlock.
    d. The VFD shall have (2) dedicated digital inputs for Customer Interlocks:

1) One interlock will not record a fault and permit running after external condition is met. Purge input will override this interlock.
2) One interlock will cause a drive fault and require control system to reset prior to returning to ready condition. This input will always be active even during Purge.

4. Relay Outputs:

   a. (2) Relay outputs, form C (1 N.O. and 1 N.C.), user programmable.
   b. Both relays must be programmable for a minimum of 16 different combinations including Drive Ready, At Frequency, Motor Running, Motor Overload, Above Frequency, Above Current and others.

5. Digital Optocoupler Output:

   a. User programmable with normally open or normally closed configuration.

6. Digital Optocoupler Output must be programmable for a minimum of 16 different combinations including Drive Ready, At Frequency, Motor Running, Motor Overload, Above Frequency, Above Current and others.
7. Internal adjustments include acceleration time shall be adjustable from 0.1 to 600 seconds, deceleration time shall be adjustable from 0.1 to 600 seconds, (4) preset speeds shall be provided, and the VFD shall have an adjustable PWM frequency to allow tuning the VFD to the motor.

8. The VFD shall have an RS-485 port as standard. The following protocols should be integral to the drive and selectable via a parameter without any field programming to download software prior to operation:

   a. Modbus RTU.
   b. Metasys N2.

9. Warranty shall be 24 months from the date of certified start-up. Factory trained application engineering and service personnel that are familiar with the VFD products offered shall be locally available. A 24 hour, 365 day technical support line shall be available.

2.4 PRESSURE TRANSMITTER

A. The Manufacturer must be certified as meeting the requirements of ISO 9001.

B. The transmitter shall be in conformance with the following industry standards:

1. EN61326:1997+A1:1998, EN55011:1998, EN61000-4-2:1995, EN61000-4-3:1996,
2. EN61000-4-4:1995, EN61000-4-5:1995,
3. EN61000-4-6:1996, EN61000-4-8:1993,
4. EN61000-4-11:1994, EN45014

C. The level of the above ground storage tank shall be sensed by a 2-wire, 4-20 ma DC pressure transmitter, mounted within a NEMA 4X fiberglass enclosure, including a pre-piped pressure gauge and shut-off and bleed valves

D. The transmitter shall be suitable for the following environmental conditions:

1. Humidity: 0 to 100% relative humidity
2. Ambient temperature limits: -40 to 185° F (-40 to 85° C)

E. The transmitter shall be suitable for liquid, gas or vapor service. The pressure limits of the transmitter shall be a minimum of twice the upper range limit of the transmitter selected for this project.

F. The transmitter shall operate from 10.5 to 36 volts DC with no load. The power supply shall originate from the RTU or MTU panel.

G. The transmitter shall be available in ranges from 0 to 1 psi to 0 to 1,000 psi.

H. The transmitter shall meet the following performance criteria:

1. Accuracy: +/- 0.25% of calibrated span
2. Stability: +/- 0.10% of upper range limit for 12 months for smart output
3. +/- 0.25% of upper range limit for 12 months for analog output
4. Vibration: 20 g

I. The transmitter shall be mounted within a NEMA 4X enclosure that shall also house shut-off and bleed valves that are mounted in the bottom of the enclosure using brass bulkhead connections. A 3-1/2" pressure gauge shall also be mounted in the enclosure and pre-piped to the transmitter and shut-off/bleed valves prior to shipment and installation.

J. CONTROL PANEL

1. The Booster Station control panel shall consist of a programmable logic controller (PLC), pump selector switches, status indication, low suction alarm/reset circuitry and hour meters to control the speed of the booster pump to maintain an operator selected pressure setting on the discharge side of the station.

2. The incoming power service to the panel shall be 120 volt AC. The enclosure shall be a NEMA 1 wall mounted with operator interface screen, selector switches and indication devices mounted on the outer door.

3. The panel shall include a main circuit breaker, pump running lights, hour meters, pump hand-off-auto selector switches, and lightning arrestor.

4. A PLC with 6" operator interface touchscreen shall be provided for control of the VFD's and allow the operator to select the pressure setpoint to maintain.

   a. The PLC shall be an Allen-Bradley MicroLogix 1400, Model Number 1766-L32AWA with a 1762-IF2OF2 Analog card or Engineer's approved equal.
   b. The touchscreen O/I shall be an Automation Direct C-More Micro, Model number EA9-T6CL

2.5 PRESSURE SWITCH AND GUAGES

A. The pressure switch controlling the low suction alarm shall be an Allen-Bradley Model 836T-T251J or Engineer's approved equal with adjustable deadband.

B. The pressure gauges on the suction and discharge lines shall be a 4-1/2" face with polypropylene case, bottom connections, bronze bourdon tube and movements. The gauge shall be a Wika 212.34 or Engineer's approved equal.

2.6 PIPING

A. All ductile iron piping outside the station shall be Class 51, mechanical joint in accordance with ANSI/AWWA C151/A21.51. Fittings for underground installation shall be mechanical joint ductile iron in accordance with ANSI/AWWA C111/AN21.11, with retainer glands.

B. All ductile iron piping within the station building shall be Class 53, flanged ANSI 125# in accordance with ANSI/AWWA C115/A21.15. All ductile iron pipe shall be cement lined and coated per AWWA C104 inside.

C. All piping 2" diameter or less shall be brass with threaded joints, schedule 40.

D. Valves 3" in diameter and larger shall be flanged joint, resilient seat type with handwheel operator and non-rising stem in accordance with AWWA C-509. Valves located on the discharge side of the booster pumps shall be capable of operating in pressures up to 300 psi.

E. Valves 2" in diameter and smaller shall be bronze ball valves with threaded ends and lever operator, rated for 300 psi WP or higher.

2.7 CHECK VALVES

A. Silent check valves shall have ASTM A126 Class B cast iron body with integral flanged ends faced and drilled to ANSI B16.1 Class 125. Flow area through the valve shall be no less than the nominal valve size.

B. 12 in. and smaller globe style valves shall have concave, double-guided plug and seat of ASTM B62 bronze with stainless steel internal spring and a renewable resilient Buna-N seat retained in a dovetail groove with a metal-to-metal backup. Larger valves shall have double-guided cast iron Buna-N rubber faced disc, a bronze seat and a stainless steel stem with bronze bushings.

C. The internal spring shall assist closure by exerting a force equivalent to 1/2 PSI in the closed position and be fully compressed at a flow velocity of 4 feet per second.

D. The valve shall be designed to open when the inlet pressure exceeds the outlet pressure by 1/2 PSI and to close without slam under all closure conditions to positively prevent the return of water when the inlet pressure decreases below the outlet pressure.

E. The valves shall be Valmatic, Inc.1806 Silent Check Valve or Engineer approved equal.

2.8 FLOW METER

A. The meter shall be a Sensus Omni Model T2 meter or Engineer approved equal.

B. Flow meter size: 2-inches.

C. The meter within the station building shall meet or exceed all requirements of ANSI/AWWA Standard C701 for Class II turbine meter assemblies. Each meter assembly shall be performance tested to ensure compliance. The meter maincase shall be of epoxy coated ductile iron composition. The epoxy coating shall be provided as standard fusion-bonded and adhere to NSF for non-lead regulation compliance.

D. The meter assembly shall have performance capability of continuous operation up to the rated maximum flows as listed below without affecting long-term accuracy or causing any undue component wear. The meter assembly shall also provide a 25% flow capacity in excess of the maximum flows listed for intermittent flow demands. Maximum headloss through the meter / strainer assembly shall not exceed those listed in the following table per meter size.

Operating Characteristics

Meter Size	1-1/2"	2"	3"	4"
Low Flow (95% Min.)	.75 gpm	1.0 gpm	1.5 gpm	2.0 gpm
Operating Range (98.5 - 101.5%)	1.25 – 160 gpm	1.5 – 200 gpm	2.5 – 500 gpm	3.0 – 1000 gpm
Intermittent Flows (98.5 - 101.5%)	200 gpm	250 gpm	650 gpm	1250 gpm
Pressure Loss (Not to Exceed)	6.9 psi @ 160 gpm	7.0 psi @ 200 gpm	5.1 psi @ 500 gpm	8.7 psi @ 1000 gpm

E. The measuring chamber shall consist of a measuring element, removable housing, and all-electronic register. The measuring element shall be mounted on a horizontal, stationary stainless steel shaft with sleeve bearings and be essentially weightless in water. The measuring element comes integrated with the advanced Floating Ball Technology design. The measuring chamber shall be capable of operating within the above listed accuracy limits without calibration when transferred from one maincase to another of the same size. The measuring shall be so configured to capture all flows as specified above.

F. The direct magnetic drive shall occur between the motion of the measuring element blade position and the electronic register. The meter shall contain a direct drive system with Floating Ball Technology, designed to extend service life, enhance low flow sensitivity and provide extended flow capacity and overall accuracy of the meter assembly. Any and all additional intermediate, magnetic or mechanical, drive couplings are not acceptable.

G. The meter's register shall be all-electronic and not contain any mechanical gearing to display flow and accurate totalization.
   1. The electronic register will include the following partial list of features:
   2. AMR resolution units fully programmable
   3. Pulse output frequency fully programmable
   4. Integral data logging capability
   5. Integral resettable accuracy testing feature
   6. Large, easy-to-read LCD display
   7. 10-year battery life guarantee

H. The meter assembly shall operate properly without leakage, damage, or malfunction up to a maximum working pressure of 200 pounds per square inch (psig).

I. The meter strainer shall be integral and cast as part of the meter's maincase. The strainer's screen shall have a minimum net open area of at least two (2) times the pipe opening and be a V-shaped configuration for the purpose of maintaining a full unobstructed flow pattern. The strainer body shall be a coated ductile iron fusion-bonded epoxy identical to that of the meter's maincase. All fasteners shall be stainless steel capable of maintaining the following static pressure ratings and physical dimensions:

Operating Characteristics

Meter Size	Maximum Operating Pressure	Centerline to Strainer Base	Overall Length (not to exceed)
1-1/2"	200 psig	2-5/16 inches	13 inches
2"	200 psig	2-5/16 inches	17 inches
3"	200 psig	4-1/8 inches	19 inches
4"	200 psig	4-3/4 inches	23 inches

J. A straightening vane assembly is mandatory and shall be positioned directly upstream of the measuring element. The straightening vane assembly shall be an integral component of the measuring chamber.

K. Flanges for the 1-1/2" and 2" size meter assemblies shall be of the 2-bolt oval flange configuration. The 3" and 4" size meter assemblies shall have flanges of the Class 125 round type, flat faced and shall conform to ANSI B16.1 for specified diameter, drilling and thickness.

L. All sizes of meter packages shall display the sizes, model, manufacturer name, and direction of flow. Such display shall be cast on the side of the meter maincase.

M. Meters shall be guaranteed against defects in material and workmanship for a period of one (1) year from date of shipment. In addition, the meter supplier shall submit nationally published literature clearly outlining its factory maintenance program and current price schedule covering complete measuring chamber exchange.

2.9 CLOSEOUT SUBMITTALS

A. Closeout Submittals must be received by Engineer and Owner before the equipment specified in this Section can be considered Substantially Complete.

B. Operation and maintenance data.

C. Manufacturer's representative reports from equipment start-up.

2.10 DELIVERY, STORAGE, AND HANDLING

A. Delivery

1. Ship all units assembled as much as practical.
2. Label all units with all labeling intact and legible with item name, model number, size, and manufacturer's name.

B. Storage

1. Store all units, accessories, and components in the manufacturer's original package, under cover and protected from damage.

C. Handling

1. Handle all units and components in accordance with the manufacturer's instructions.
2. Use lifting rings and canvas harnesses for lifting to prevent scratching or abrading finished surfaces.
3. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover, to protect units from dirt, water, construction debris, and traffic.
4. Handle carefully, in accordance with manufacturer's written instructions, to avoid damage to components, enclosure, and finish.

2.11 HYDROPNEUMATIC TANK

A. The tanks shall be a Wessels Model FX 200 or Engineer's approved equal.

B. A hydropneumatic bladder tank shall be ASME rated and furnished and installed as shown on the plans and specified herein for accepting flow/pressure during "no flow" periods. The tank shall have an acceptance volume of 52 gallons minimum, 22" diameter x 49" high vertical pre-charged steel with replaceable heavy-duty rubber bladder. The tanks shall have a bottom NPT system connection and a 0.302"-32 charging valve connection (standard tire valve) to facilitate the on-site charging of the tank to meet system requirements.

C. The tank shall be fitted with lifting rings and floor-mounting legs for vertical installation. The tank must be constructed for a maximum 150 psi working pressure. The tank shall have a baked epoxy exterior finish.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Site Verification of Conditions. Before installation of equipment, verify that:

1. All clearances have been met.
2. Bases, anchors, supports, and openings are located correctly and are of the proper size and material.

B. Variations: Correct any variations from the requirements shown or required by the manufacturer at no additional cost to the Owner. Submit all methods of correction in writing.

3.2 PREPARATION

A. Protect all surface areas from damage. Protect all finished floors with a waterproof, oil-resistant cover to prevent staining from oil and/or grease.

3.3 INSTALLATION

A. General: Install all pumps and other components in accordance with the manufacturer's instructions and the conforming Shop Drawings, including all gasket seals, isolation dampeners, cleanouts, drains, gauges, motors, controls, and power wiring.

B. Pumps:

C. Actual pump piping connections shall vary among pump manufacturers. Coordinate pump piping connections with pump supplier and piping supplier.

D. Set anchor rods in accordance with the approved manufacturer's conforming submittals.

E. Lubrication: Furnish and apply an initial supply of grease and oil as recommended by the manufacturer. Grease and oil the equipment throughout all testing until substantial completion.

F. Base: Anchor and grout the base in accordance with the manufacturer's recommendations. Connect base drain to nearest floor drain.

G. Interface with Other Products

1. Complete all electrical power and control connections under Division 26 – Electrical.
2. Paint the equipment in accordance with Section 099010.01 - Coating Systems For Wastewater Equipment
3. Install and connect all piping.
4. Perform field quality control as specified in this specification.

3.4 REPAIRS AND RESTORATION

A. Repair or replace any damage to the pump or motor or chips, dents, scratches, stains, or other disfiguring of surrounding floors, walls and/or accessories to the satisfaction of the Owner and/or Engineer at no additional cost to the Owner.

3.5 FIELD QUALITY CONTROL

A. Manufacturer's Field Service and Start-Up

1. A qualified representative of each equipment manufacturer shall start up the pumps in accordance with Section 017900, "Demonstration and Training".
2. Representative shall spend at least 1 day performing the required services for each type of pump.

B. Noise and Vibration limitations. For an acceptable installation, the pump and motor combination shall operate without excessive vibration, noise, or bearing temperatures, under the specified conditions. Guidelines to establish excessive pump vibration shall be as described in ANSI/HI 9.6.4.

3.6 CLEANING

A. Clean the pump, motor, accessories, and surrounding areas of all foreign material, grease, and oil stains.

B. Remove all rags, sticks, debris, and construction materials. Replace damaged equipment components in like kind at no additional cost.

C. After cleaning, provide protective covering for each piece of equipment.

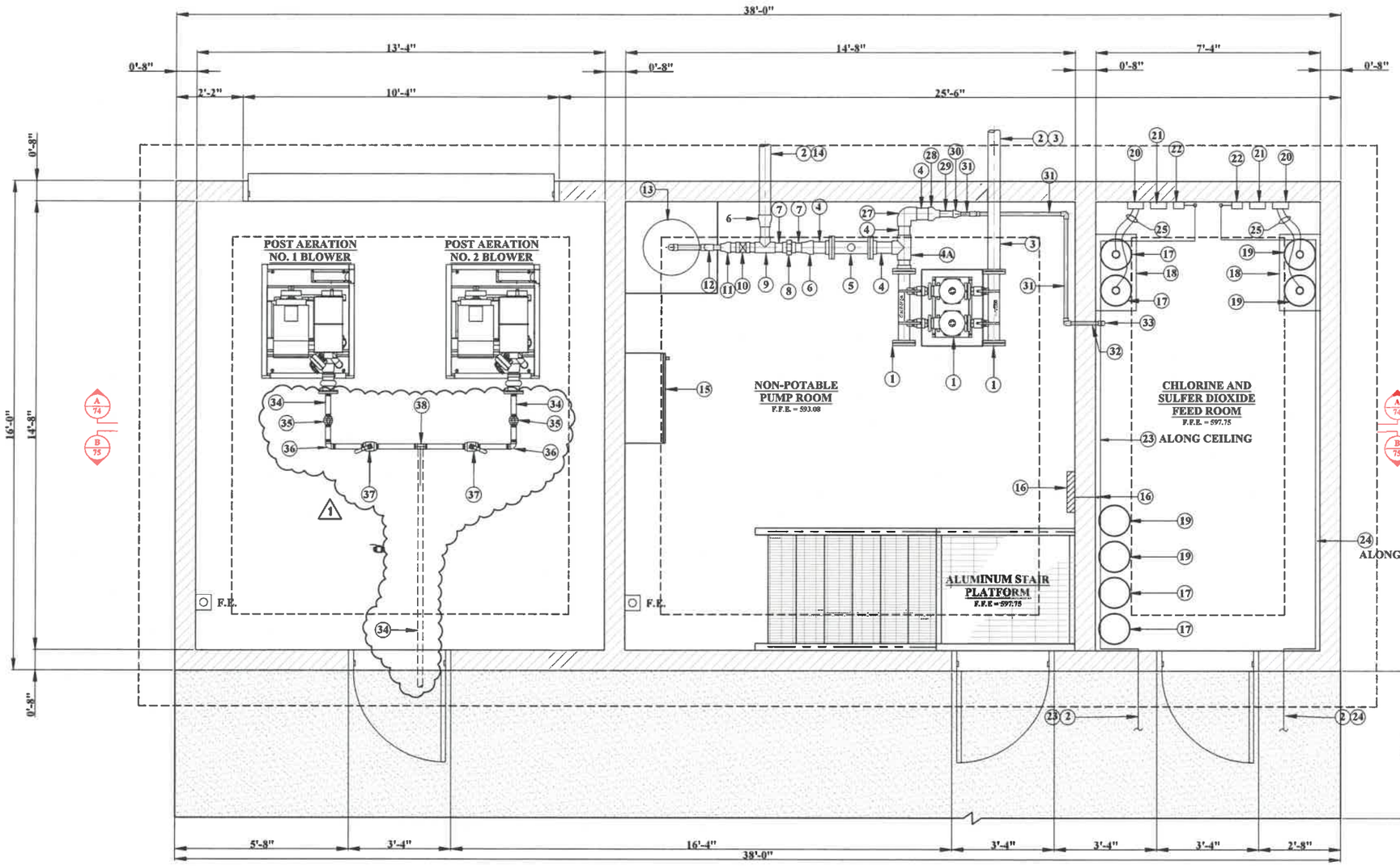
3.7 SPARE PARTS

A. Spare parts shall be submitted by Contractor before the equipment will be considered Substantially Complete.

B. Spare parts shall include the following:

1. O-Ring kit
2. Bearings
3. Upper and Lower Seals

END OF SECTION 432520



CHLORINE / NPW BUILDING - FLOOR PLAN
SCALE: 1/2" = 1'-0"

LEGEND

FE FIRE EXTINGUISHER

GENERAL NOTES

1. REFER TO SHEET 76 FOR ROOM SCHEDULE AND DOOR DETAILS.

PIPING LEGEND NOTES

2 (1) DUPLEX NON-POTABLE WATER PUMP ASSEMBLY (REFER TO SPECIFICATION 461320). MOUNT ON 2'-0"W x 2'-6"L x 9-11/16" HIGH CONCRETE HOUSE KEEPING PAD.

(2) REFER TO SHEET 26 FOR CONTINUATION.

(3) 4" DIP PUMP SUCTION.

(4) 4" SCH. 80 PVC.

(4A) 4" SCH. 80 PVC TEE.

(5) 4" D.I. FL. WYE STRAINER.

(6) 4" x 3" SCH. 80 PVC REDUCING BUSHING.

(7) 3" SCH. 80 PVC.

(8) 3" SCH. 80 PVC UNION.

(9) 3" SCH. 80 PVC TEE.

(10) 3" PVC BALL VALVE.

(11) 3" x 1-1/2" SCH. 80 PVC REDUCING BUSHING.

(12) 1-1/2" SCH. 80 PVC.

(13) 52 GALLON HYDRO-PNUEMATIC TANK ON 3'-0" x 3'-0" x 4" HIGH CONCRETE HOUSEKEEPING PAD.

(14) 4" DIP DISCHARGE.

(15) NPW PACKAGED BOOSTER PUMP CONTROL PANEL.

(16) CHLORINE GAS DETECTOR AND SENSOR. PROVIDE AIR TIGHT SEAL FOR SENSOR CABLE THRU WALL. MOUNT DETECTION DISPLAY 5'-0" A.F.F. AND SENSOR 12" A.F.F.

(17) 150 LB CHLORINE GAS CYLINDERS.

(18) DUAL CYLINDER ELECTRONIC SCALE.

(19) 150 LB SULFUR DIOXIDE GAS CYLINDER.

(20) PRESSURE RELIEF VALVE ASSEMBLY.

(21) METERING PANEL ASSEMBLY.

(22) SMART VALVE CONTROLLER.

(23) 1" SCH. 80 PVC CHLORINE SOLUTION TO CHLORINE CONTACT TANK. ALONG CEILING

(24) 1" SCH. 80 PVC SO2 SOLUTION TO CHLORINE CONTACT TANK.

(25) SCH. 80 PVC OR PVC TUBING.

(26) REFER TO SHEET 141 FOR WATER SERVICE TO CHLORINE ROOM.

(27) 4" SCH. 80 PVC 90° BEND.

(28) 4" x 2" SCH. 80 PVC REDUCING BUSHING.

(29) 2" SCH. 80 PVC.

(30) 2" x 1" SCH. 80 PVC REDUCING BUSHING.

(31) 1" SCH. 80 PVC.

(32) 1" SCH. 80 PVC UP THRU WALL. PROVIDE AIR TIGHT SEAL.

(33) REFER TO SHEET 141 FOR CONTINUATION.

1 (34) 2" SCH. 40 BLACK STEEL AIR PIPE

(35) 2" SCH. 40 BLACK STEEL UNION

(36) 2" SCH. 40 BLACK STEEL 90° BEND

(37) 2" THREADED BALL VALVE

(38) 2" SCH. 40 BLACK STEEL TEE

NO.	BY	DATE	DESCRIPTION
1	PL	3/17/22	ADDENDUM No. 2
2	PL	3/24/22	ADDENDUM No. 3

WEST VIRGINIA 811

SCALE: 1/2"=1'-0"	
DRAWN: P.LANTZ	DATE: 9/2021
CHECKED: R. HUDKINS	DATE: 1/2022
APPROVED: D. FERRELL	DATE: 2/2022
SURVEY DATE:	
SURVEY BY:	
FIELD BOOK No.:	

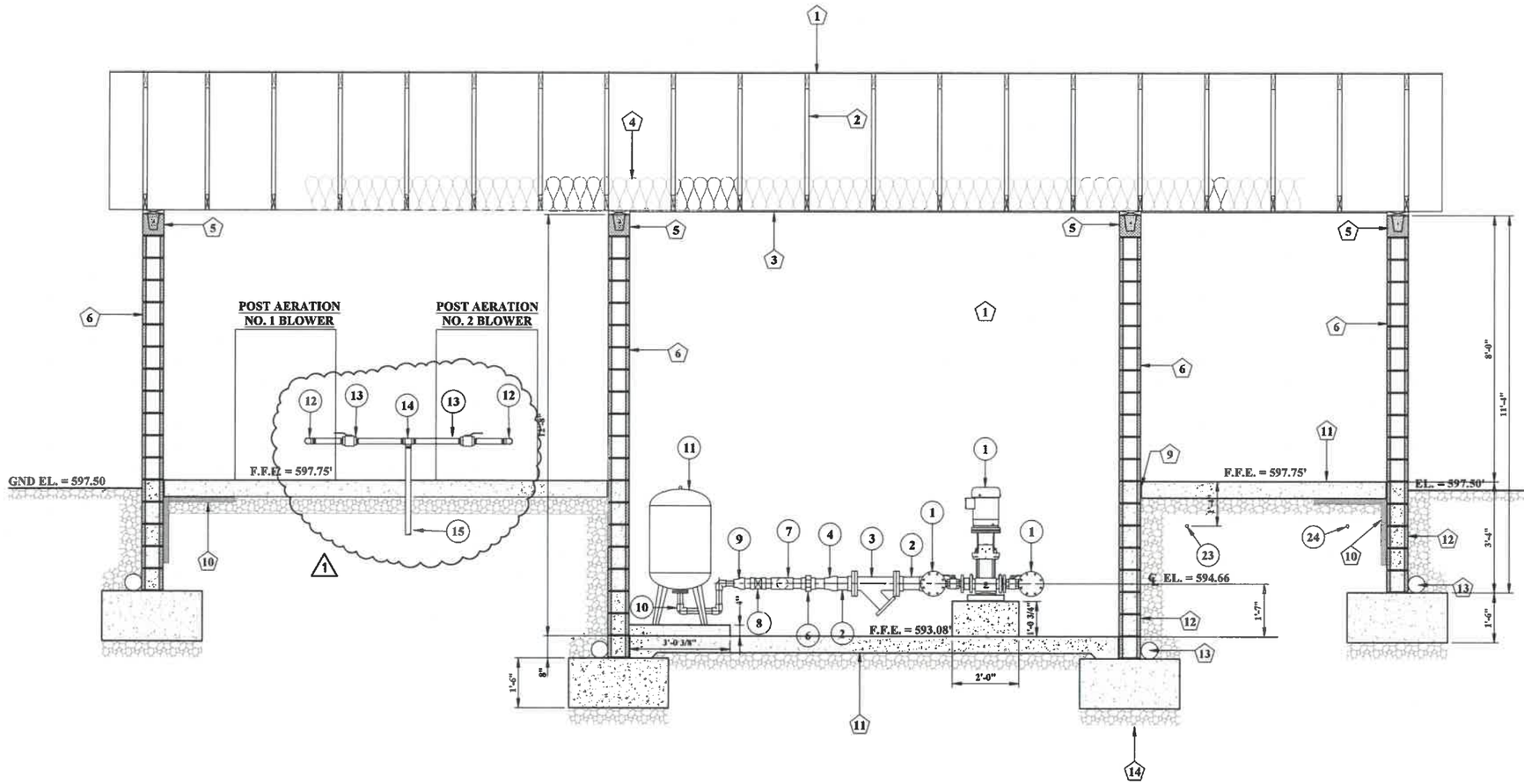
THRASHER
300 ASSOCIATION DRIVE
CHARLESTON, WV 25311
www.thrashereng.com
PHONE (304)-343-7501
FAX (304)-343-7604

PHASE No.	
CONTRACT No.	3
PROJECT No.	101-020-1535

CITY OF RIPLEY
PROPOSED 1.2 MILLION GALLONS PER DAY
WASTEWATER TREATMENT PLANT
CHLORINE / NPW BUILDING
PROPOSED FLOOR PLAN

SHEET No. 71

CAD FILE: R:\020\020-1535-WWTP-RIPLEY-\Drawing\Contract #3\Drawings\03-015-Chem Building.dwg
PLOT DATE/TIME: 3/25/2022 10:42 AM
LAYOUT: SHEET 71
USER: philip lantz



SECTION A
SCALE 1/2" = 1'-0" 71

BUILDING LEGEND NOTES

1. STANDING SEAM METAL ROOF OVER FELT PAPER, 5/8" PLYWOOD.
2. PRE-ENGINEERED ROOF TRUSSES AT 16" O.C.
3. 5/8" PLYWOOD (PAINTED).
4. 6" FIBERGLASS INSULATION WITH KRAFT PAPER BACKING.
5. 8" SMOOTH FACE CMU BOND BEAM W/ 2-#5 BARS CONTINUOUS.
6. 8" SPLIT FACE BLOCK.
7. VINYL SOFFIT (VENTED), 6" FASCIA PANEL, ALUMINUM DRIP EDGE. (NOT SHOWN IN THIS SECTION)
8. 6" ALUMINUM GUTTER WITH 5" x 6" ALUMINUM DOWNSPOUT AND PRECAST CONCRETE SPLASH PAD. (NOT SHOWN IN THIS SECTION)
9. 3/4" DEEP JOINT SEALANT OVER 3/8" EXP. JOINT MATERIAL.
10. FOUNDATION INSULATION BOARD.
11. 6" CONCRETE SLAB OVER 10 MIL. VAPOR BARRIER.
12. 8" SMOOTH FACE MASONRY FOUNDATION WALL - GROUT VOIDS SOLID W/ CONCRETE FILL.
13. 6" PERF. PVC FOUNDATION DRAIN IN STONE TRENCH WRAPPED WITH FILTER FABRIC.
14. 6" COMPACTED AGGREGATE BASE.

PIPING LEGEND NOTES

2
1. DUPLEX NON-POTABLE WATER PUMP ASSEMBLY (REFER TO SPECIFICATION 461320). MOUNT ON 2'-0"W x 2'-6"L x 9-11/16" HIGH CONCRETE HOUSE KEEPING PAD.
2. 4" SCH. 80 PVC.
3. 4" D.I. FL. WYE STRAINER.
4. 4" X 3" SCH. 80 PVC REDUCING BUSHING.
5. 3" SCH. 80 PVC.
6. 3" SCH. 80 PVC UNION.
7. 3" SCH. 80 PVC TEE.
8. 3" PVC BALL VALVE.
9. 3" x 1-1/2" SCH. 80 PVC REDUCING BUSHING.
10. 1-1/2" SCH. 80 PVC.
11. 52 GALLON HYDRO-PNEUMATIC TANK ON 3'-0" x 3'-0" x 4" HIGH CONCRETE HOUSEKEEPING PAD.
12. 2" SCH. 40 BLACK STEEL 90° BEND
13. 2" THREADED BALL VALVE
14. 2" SCH. 40 BLACK STEEL TEE
15. 2" SCH. 40 BLACK STEEL PIPE

1

NO.	BY	DATE	DESCRIPTION
1	PL	3/17/22	ADDENDUM No. 2
2	PL	3/24/22	ADDENDUM No. 3

WEST VIRGINIA 811

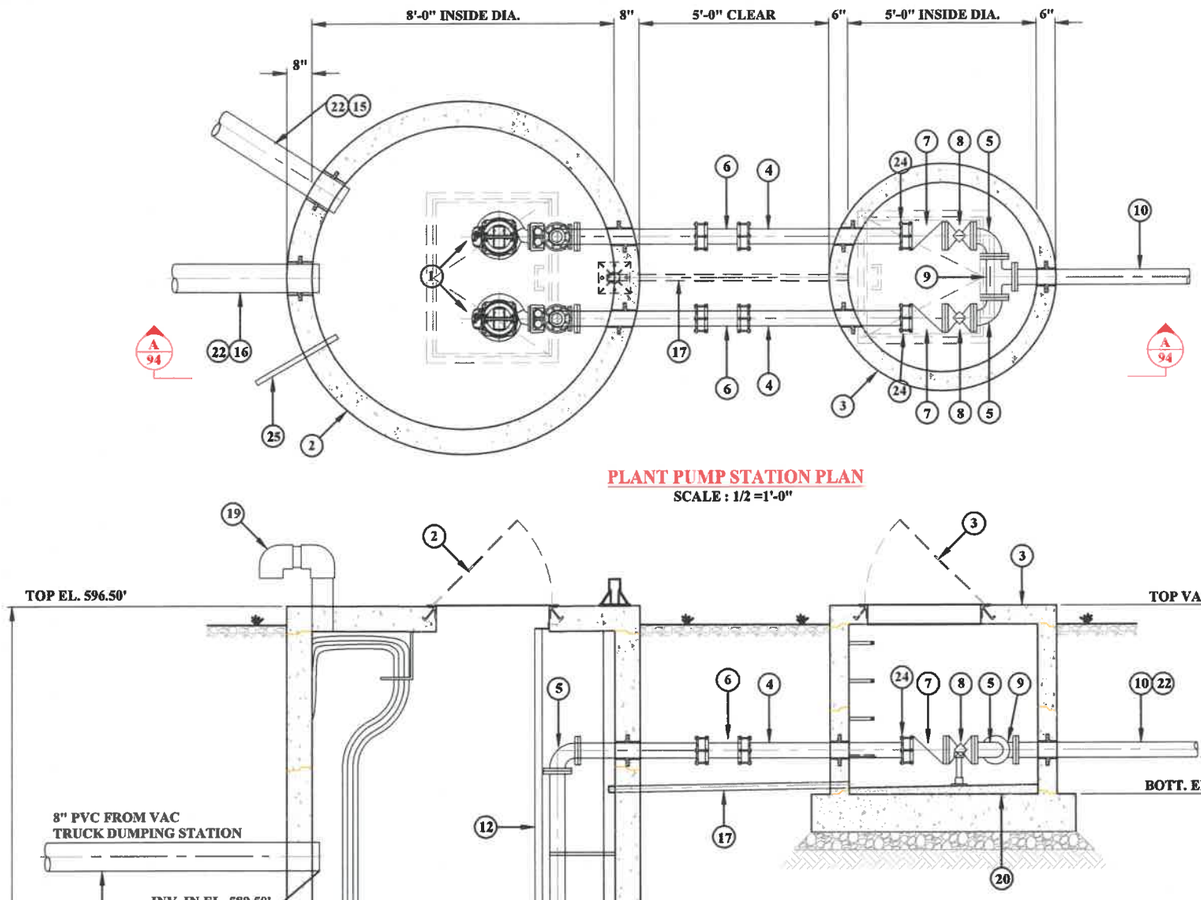
SCALE: 1/2"=1'-0"	
DRAWN: P.LANTZ	DATE: 9/2021
CHECKED: R. HUDKINS	DATE: 1/2022
APPROVED: D. FERRELL	DATE: 2/2022
SURVEY DATE:	
SURVEY BY:	
FIELD BOOK No.:	

THRASHER
300 ASSOCIATION DRIVE
CHARLESTON, WV 25311
www.thrasherenq.com
PHONE (304)-343-7601
FAX (304)-343-7604

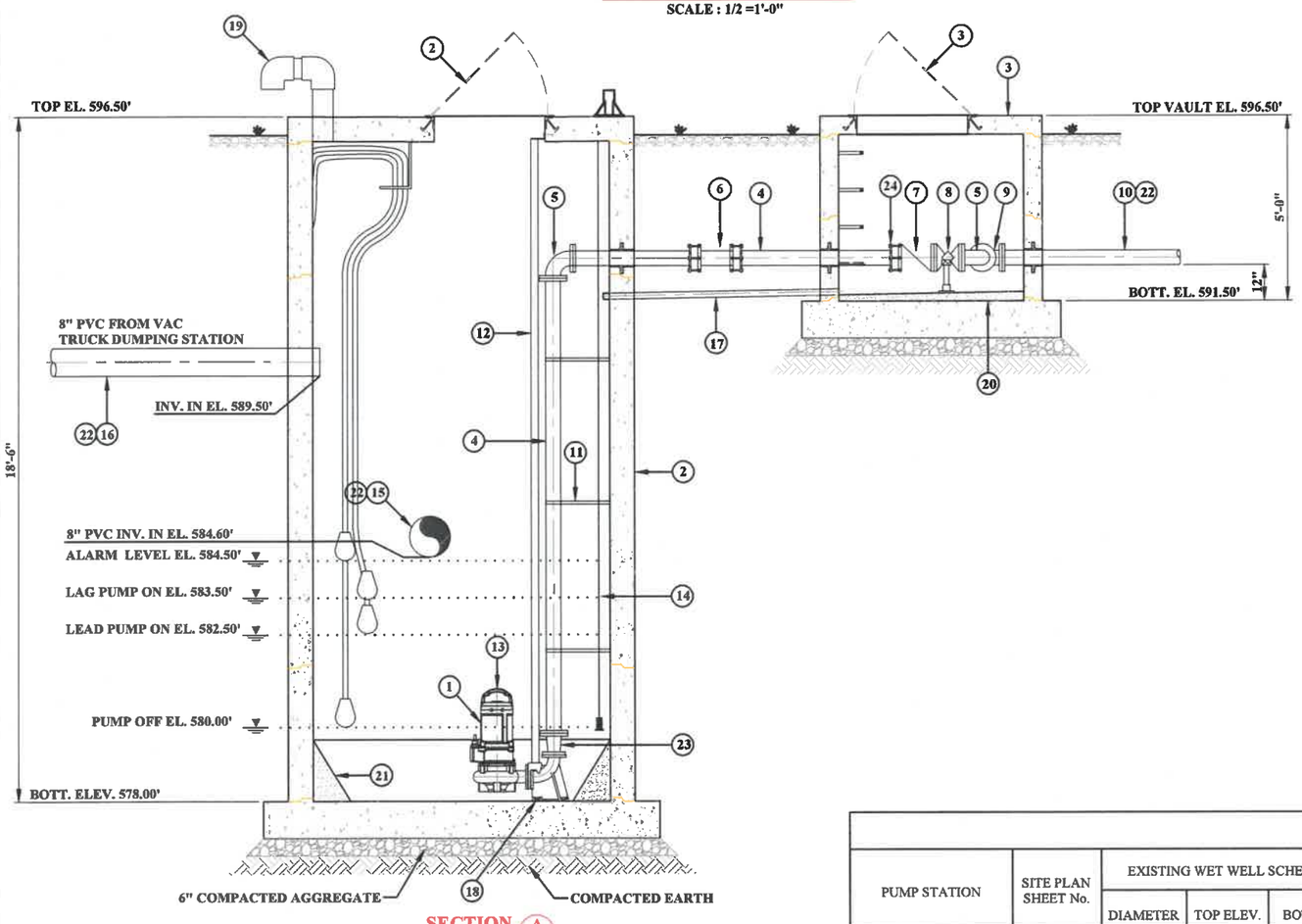
PHASE No.	
CONTRACT No.	3
PROJECT No.	101-020-1535

CITY OF RIPLEY
PROPOSED 1.2 MILLION GALLONS PER DAY
WASTEWATER TREATMENT PLANT
CHLORINE / NPW BUILDIING
PROPOSED SECTION A

SHEET No. 74



PLANT PUMP STATION PLAN
SCALE : 1/2 =1'-0"



SECTION A 94

PAINTING NOTE:

1 PAINT ALL EXPOSED PIPING, FITTINGS AND VALVES IN THE WET WELL AND VALVE VAULT PER SPECIFICATION SECTION 099010.

KEY NOTES:

1. TWO (2) RAW SEWAGE PUMPS. SEE SPECIFICATION 333219 AND CHART BELOW FOR DETAILS.
2. PROPOSED 8'-0"Ø x 18'-6" DEEP WET WELL W/ 36" x 48" ACCESS HATCH. SEE SPECIFICATION 083500 FOR HATCH DETAILS.
3. PROPOSED 5'-0"Ø x 5'-0" DEEP VALVE VAULT W/ 36" x 36" ACCESS HATCH. SEE SPECIFICATION 083500 FOR HATCH DETAILS.
4. 4" D.I. DISCHARGE PIPING.
5. 4" FL D.I. 90° BEND. (TYP. OF 4)
6. 4" MJ SOLID SLEEVE W/ MEGA-LUGS RESTRAINTS. (TYP. OF 2)
7. 4" SWING TYPE CHECK VALVE. (TYP. OF 2)
8. 4" PLUG VALVE. (TYP OF 2)
9. 4" FL D.I. TEE FITTING.
10. 4" DIP FORCE MAIN.
11. INTERMEDIATE STAINLESS STEEL PIPE SUPPORT.
12. 2" STAINLESS STEEL GUIDERAIL.
13. STAINLESS STEEL LIFTING CHAIN.
14. PUMP LEVEL SYSTEM.
15. 8" GRAVITY SEWER LINE
16. 8" PVC FROM VAC TRUCK DUMPING STATION.
17. 2" PVC DRAIN W/TRAP AND BALL TYPE CHECK VALVE.
18. ANCHOR BOLTS PER MANUFACTURERS RECOMMENDATIONS.
19. 4" SCH 80 PVC VENT W/STAINLESS STEEL BIRD SCREEN.
20. GROUT FILL SLOPE TO DRAIN.
21. GROUT SLOPE, SEE DETAIL SHEET 95.
22. SEE SHEET No. 24 FOR CONTINUATION.
23. 4" x 3" FL D.I. REDUCER.
24. MEGA-FLANGE
25. 1.5" HDPE FORCE MAIN

PUMP INFO

MAKE	MODEL	HP	VOLT/PH	GPM	TDH
FLYGHT	NP 3085	3.5	460/3	170	28'

PUMP STATION INFORMATION TABLE

PUMP STATION	SITE PLAN SHEET No.	EXISTING WET WELL SCHEDULE			NEW VALVE VAULT SCHEDULE			DISCHARGE PIPING ℄ ELEV.	INFLUENT GRAVITY SEWER		GRADE ELEV.	FLOAT SETTINGS			
		DIAMETER	TOP ELEV.	BOT ELEV.	DIAMETER	TOP ELEV.	BOT ELEV.		12"	8"		ALARM	LAG PUMP ON	LEAD PUMP ON	PUMPS OFF
PLANT PUMP STATION	4	8'-0"	596.50'	578.00'	5'-0"	596.50'	591.50'	592.83'	584.60'	589.50'	596.00'	584.50'	583.50'	582.50'	580.00'

NO.	BY	DATE	DESCRIPTION
1	PL	3/24/22	ADDENDUM No. 3

WEST VIRGINIA 811

SCALE: NOT TO SCALE
DRAWN: P.LANTZ DATE: 9/2021
CHECKED: R. HUDKINS DATE: 1/2022
APPROVED: D. FERRELL DATE: 2/2022
SURVEY DATE:
SURVEY BY:
FIELD BOOK No.:

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CONTRACT No. 3
PROJECT No. 101-020-1535

CITY OF RIPLEY
PROPOSED 1.2 MILLION GALLONS PER DAY
WASTEWATER TREATMENT PLANT
PROPOSED PLANT PUMP STATION
PLAN, SECTIONS & GENERAL NOTES

SHEET No. 94

CAD FILE: R:\020\020-1535-WWTP-RIPLEY-\Drawing\Contract #3\Drawings\C3-018-Plant Pump Station.dwg PLOT DATE/TIME: 3/24/2022 1:40 PM LAYOUT: SHEET 94 USER: philip lantz