ADDENDUM NO. 1

TO: PLANS AND SPECIFICATIONS FOR STATE OF MISSOURI

Sewer System Improvements
Crowder State Park
Trenton, Missouri
Project No. X2322-02

Bid Opening Date: 1:30 PM, Thursday, October 17, 2024 (Not Changed)

Bidders are hereby informed that the construction Plans and/or Specifications are modified as follows:

SPECIFICATION CHANGES:

1. Section 333123 – Sanitary Sewerage Force Main Piping
   a. ADD Reference Standards 1.04 H, L, N, P, Q, and R
   b. ADD Submittals 1.05 F and G
   c. ADD Force Main Pipe Materials 2.01 B and D
   d. ADD Jointing 3.05 A and C
   e. ADD Field Quality Control 3.09
   f. ADD Protection 3.10
   g. See attached revised specification section.

DRAWING CHANGES:

1. Sheet C-103
   a. Effluent Pump Sizing note changed.
   b. Added secondary power generator note.
   c. Added system and pump curves.
   d. Added imported soil estimate.
   e. See attached revised drawing.

2. Sheet C-104
   a. Effluent Pump Sizing note changed.
   b. Added secondary power generator note.
   c. Added system and pump curves.
   d. Added imported soil estimate.
   e. See attached revised drawing.

GENERAL COMMENTS:

1. The Pre-Bid Meeting was held on October 2, 2024 at 2:00 PM. The Pre-Bid Meeting sign-in sheet is attached.
2. Please contact Mandy Roberson, Contract Specialist, at 573-522-0074 or Mandy.Roberson@oa.mo.gov for questions about bidding procedures, MBE\WBE\SDVE Goals, and other submittal requirements.
3. The deadline for technical questions was October 9, 2024 at 12:00 PM.
4. Changes to, or clarification of, the bid documents are only made as issued in the addenda.
5. All correspondence with respect to this project must include the State of Missouri project number as indicated above.

6. Current Plan holders list available online at https://www.adsplanroom.net/projects/2611/plan-holders/x2322-02-sewer-system-improvements-crowder-state-park
7. Prospective Bidders contact American Document Solutions, 1400 Forum Blvd Suite 1C, Columbia MO 65201, 573-446-7768 to order official plans and specifications.
8. **All bids shall be submitted on the bid form without additional terms and conditions, modifications, or stipulations. Each space on the bid form shall be properly filled. Failure to do so will result in rejection of the bid.**
9. **MBE/WBE/SDVE participation requirements can be found in DIVISION 00. The MBE/WBE/SDVE participation goals are 0%/0%/3%, respectively. Only certified firms as of the bid opening date can be used to satisfy the MBE/WBE/SDVE participation goals for this project. If a bidder is unable to meet a participation goal, a Good Faith Effort Determination Form must be completed. Failure to complete this process will result in rejection of the bid.**

ATTACHMENTS:

1. Pre-Bid Meeting Sign-In Sheet
2. Section 333123 – Sanitary Sewerage Force Main Piping
3. Sheet C-103
4. Sheet C-104

October 9, 2024

END OF ADDENDUM NO. 1

Sewer System Improvements
Crowder State Park
Trenton, MO

Project No. X2322-02
October 2, 2024

Name & Title	Company Name	Phone	E-Mail Address
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Patricks Schultz	Better By Design, LLC	573727 4182	pschultz@betterbydesignllc.com

SECTION 333123
SANITARY SEWERAGE FORCE MAIN PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sanitary sewerage force main and inverted siphon piping, fittings, and accessories.

B. Valves, Valve Vaults, Valve Manholes, and Thrust Restraints.

C. Connection of facility sanitary force main and inverted siphon system to headworks.

1.02 RELATED REQUIREMENTS

A. Section 312316 - Excavation: Excavating of trenches.

B. Section 312316.13 - Trenching: Excavating, bedding, and backfilling.

C. Section 312323 - Fill: Bedding and backfilling.

D. Section 333113 - Site Sanitary Sewerage Gravity Piping.

1.03 DEFINITIONS

A. Bedding: Fill placed under, beside and directly over pipe, prior to subsequent backfill operations.

1.04 REFERENCE STANDARDS

A. ASME B1.20.1 - Pipe Threads, General Purpose, Inch; 2013 (Reaffirmed 2018).

B. ASME B1.20.2M - Pipe Threads, 60 Deg, General Purpose; 2006 (Reaffirmed 2011).

C. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250; 2020.

D. ASME B16.34 - Valves — Flanged, Threaded, and Welding End; 2020.

E. ASSE 1001 - Performance Requirements for Atmospheric Type Vacuum Breakers; 2021.

F. ASTM D1784 - Standard Classification System and Basis for Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds; 2020.

G. ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120; 2021a.

H. ASTM D2122 - Standard Test Method for Determining Dimensions of Thermoplastic Pipe and Fittings; 2022.

I. ASTM D2241 - Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series); 2020.

J. ASTM D2464 - Standard Specification for Threaded Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80; 2023.

K. ASTM D2564 - Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems; 2020.

L. ASTM D2657 - Standard Practice for Heat Fusion Joining of Polyolefin Pipe and Fittings; 2007 (Reapproved 2023).

M. ASTM D2774 - Standard Practice for Underground Installation of Thermoplastic Pressure Piping; 2021a.

N. ASTM D3035 - Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter; 2022.

O. ASTM D3139 - Standard Specification for Joints for Plastic Pressure Pipes using Flexible Elastomeric Seals; 2019.

P. ASTM D3350 - Standard Specification for Polyethylene Plastics Pipe and Fittings Materials; 2021.

Q. ASTM D4101 - Standard Classification System and Basis for Specification for Polypropylene Injection and Extrusion Materials; 2017, with Editorial Revision (2019).

R. ASTM F2620 - Standard Practice for Heat Fusion Joining of Polyethylene Pipe and Fittings; 2020a, with Editorial Revision (2022).

S. ASTM F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe; 2014 (Reapproved 2021).

T. AWWA C207 - Steel Pipe Flanges for Waterworks Service, Sizes 4 in. through 144 in. (100 mm through 3600 mm); 2023.

U. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. through 60 In. (100 mm through 1500 mm); 2022.

V. MSS SP-25 - Standard Marking System for Valves, Fittings, Flanges and Unions; 2018, with Errata (2023).

1.05 SUBMITTALS

A. See Section 013300 - Submittals, for submittal procedures.

B. Product Data: Provide data indicating pipe, pipe accessories.

C. Product Data: Manufacturer's data sheets for each item of equipment and material provided, showing compliance with requirements; include materials, pressure ratings, seats and seals, clearances for operation and maintenance, and other characteristics.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

E. Manufacturer's Installation Instructions: Indicate special procedures required to install Products specified.

F. Hydrostatic Test Report: Document results of field quality control testing. Submit copies of all reports of field tests.

G. Project Record Documents:
   1. Record location of piping, connections, valves, valve vaults, valve manholes, thrust restraints, and invert elevations.
   2. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

H. Maintenance Materials:
   1. For Each Type and Size of Valve:
      a. Lubricator, lubricant of appropriate temperature rating, lubricator/isolating valve.
      b. Gaskets; two each.
      c. O-ring seals; two each.
      d. Diaphragms (molded); two each.
      e. Other parts made of elastomeric materials; two each.
      f. Stem packing; two each.
      g. Seat rings; two each.
   2. One set of special tools necessary for adjustment, operation, maintenance and disassembly.

I. One set of special tools necessary for adjustment, operation, maintenance and disassembly.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Do not damage pipe, fittings and accessories, and pipe coatings during delivery, handling, and storage.

B. Do not place materials on private property without written permission of property owner.

PART 2 PRODUCTS

2.01 FORCE MAIN PIPE MATERIALS

A. Provide products that comply with applicable code(s).

B. Polypropylene (PP) Pipe: ASTM D2122 and ASTM D4101, Polypropylene (PP) material; pipe and fittings same material utilizing transition fittings when connecting to existing piping.
   1. Joints, Heat Fusion Joints: ASTM D2657.

C. PVC Pipe:
   1. PVC Pipe and Fittings: Less than 4 inches diameter: ASTM D1785, Schedule 40, or ASTM D2241, SDR 21, with screw joints, push-on joints, or solvent weld joints.
   2. PVC Pipe and Fittings: 4 inches, diameter and larger: ASTM D2241, SDR 21, or AWWA C900, Class 100, with push-on joints.
   3. Joints:
      a. Screw Joint Fittings: ASTM D2464, Schedule 80.
      b. Push-On Joint Fittings: ASTM D3139, with ASTM F477 gaskets.
      c. Solvent Cement: ASTM D2564.
      d. Couplings for use with plain end pipe with centering rings or stops to center the coupling on the joint.

D. Polyethylene (PE) Pipe: ASTM D3350 and ASTM D3035, Polyethylene (PE) material (DR-PR), minimum pressure rating of 100 psi, at 73.4 degrees F. Thermal butt fusion joints and fittings in accordance with manufacturer's recommendations; pipe and fittings same material utilizing transition fittings when connecting to existing piping.
   1. Joints:
      a. Heat Fusion Joints: ASTM F2620.
      b. Mechanical Joints: ASME B16.1.
      c. Flanged Joints: ASME B16.1 or AWWA C207.

E. Fittings: Same material as pipe molded or formed to suit pipe size and end design, in required tee, bends, elbows, cleanouts, reducers, traps and other configurations required.

2.02 PIPE ACCESSORIES

A. Trace Wire: Magnetic detectable conductor, clear plastic covering, imprinted with "Force Main Sewer Service" in large letters.

2.03 VALVE APPLICATIONS

A. Valve Applications: Provide valves as follows whether shown on layout drawings or not.

B. Do not direct-bury flanged valves; provide valve vault or manhole as indicated on layout drawings.

2.04 REQUIREMENTS APPLICABLE TO ALL VALVES

A. See layout drawings for valve sizes, valve ratings, operator types, and piping types and sizes.

B. Provide valves suitable for the service indicated and coordinated to piping system.
   1. Provide valves that will withstand working pressure indicated or working pressure of pipe to which valve is connected, whichever is greater.
   2. Provide valves of sizes indicated or of port diameter/area equal to that of pipe to which valve is connected, whichever is larger.
   3. Provide valves that open by turning counterclockwise, with direction of opening integrally marked on operating nut or operator.
   4. Valve End Connections: As indicated; if not indicated, provide end connections of the same type as indicated for joints in pipe to which valve is connected.
   5. Factory install operators and accessories.

C. Identification and Tagging: Mark valves in accordance with MSS SP-25 using identification tags securely attached; on tags show the service, valve identification number from layout drawings, manufacturer's name and model number.
   1. Identification Tags: 1.375 inches diameter, minimum; engraved laminated plastic with black lettering.
   2. Attachment: No. 12 AWG copper wire.

2.05 AIR RELEASE VALVES

A. Manufacturers:
   1. Cla-Val Company: www.cla-val.com/#sle.
   2. Watts: www.watts.com/#sle.
   3. Zurn Industries, Inc: www.zurn.com/#sle.
   4. Substitutions: See General Conditions.

B. Air Release Valves:
   1. Locate and vent in manner that upon operation a hazardous atmosphere will not be created.
   2. Provide air release valves at all piping high points and where indicated on layout drawings.

C. Air/Vacuum Valve for Corrosive Service: ASSE 1001; functioning to automatically exhaust air during filling of system while allowing air to re-enter during draining or when vacuum occurs.
   1. Rating: 150 psig working pressure.
   2. Body: Cast iron standard elongated body and cover.
   3. Trim and Float: Stainless steel.
   4. End Connections:
      a. Sizes 1/2 through 3 inches: Threaded inlet and outlet, ASME B1.20.1 (ASME B1.20.2M) threading.
      b. Sizes 4 to 12 inches (100 to 300 mm): Flanged per ASME B16.1 Class 150, ASTM A126 Class B.
   5. Provide blow off valve, quick disconnect couplings, and minimum 6 feet of hose for back flushing after installation without dismantling valve.

D. Air Release Valve for Corrosive Service: Factory Mutual listed; functioning to automatically exhaust entrained air that accumulates in system.
   1. Rating: 150 psig working pressure.
   2. Body: Cast iron standard elongated body and cover.
   3. Trim and Float: Stainless steel.
   4. End Connections:
      a. Sizes 1/2 through 3 inches: Threaded inlet and outlet, ASME B1.20.1 (ASME B1.20.2M) threading.
      b. Sizes 4 and up (100 mm and up): Flanged per ASME B16.1 Class 150, ASTM A126 Class B.
   5. Provide blow off valve, quick disconnect couplings, and minimum 6 feet of hose to permit back flushing after installation without dismantling valve.

E. Combination Air Valve Suitable for Corrosive Service: Combined air and vacuum valve and air release valve.
   1. Function: Automatically exhaust air during filling of a piping system and allow air to re-enter during draining or when vacuum occurs; automatically exhaust entrained air that accumulates in piping system.
   2. Rating: 150 psig working pressure.
   3. Body: Cast iron standard elongated body and cover.
   4. Trim and Float: Stainless steel.
   5. End Connections:
      a. Sizes 1/2 through 3 inches: Threaded inlet and outlet, ASME B1.20.1 (ASME B1.20.2M) threading.
      b. Sizes 4 and up (100 mm and up): Flanged per ASME B16.1 Class 150, ASTM A126 Class B.
   6. Provide blow off valve, quick disconnect couplings, and minimum 6 feet of hose to permit back flushing after installation without dismantling valve.

PART 3 EXECUTION

3.01 GENERAL

A. Perform work in accordance with applicable code(s).

3.02 EXCAVATION, TRENCHING, AND BACKFILLING

A. Hand trim excavation for accurate placement of pipe to elevations indicated.

B. Backfill around sides and to top of pipe with cover fill, tamp in place and compact, then complete backfilling. Correct over-excavation. See Section 312316.13 for additional requirements.

3.03 PREPARATION

A. Cut pipe ends square with mechanical cutters. Use wheel cutters where practicable. Remove burrs, sharp and rough edges and grind smooth. Remove loose material from pipe before laying.

3.04 INSTALLATION - PIPE

A. Maintain horizontal and vertical separation of force main from water main piping in accordance with MoDNR code.

B. Maintain horizontal separation of force main from water main piping of at least 10 feet in all horizontal directions.

C. Maintain vertical separation of force main from water main piping of at least 18 inches in all vertical directions.

D. Verify trench cut is ready to receive work and excavations, dimensions, and elevations are as indicated on layout drawings.

E. Before lowering and while suspended, inspect pipe and each fitting for defects. Installation of defective material is not permitted.

F. Where pipe, fittings or joint materials have been soiled by earth in handling, thoroughly clean soiled surfaces by wire brushing and wiping until all traces of earth are removed before joining pipe.

G. Maintain interior of all pipes thoroughly clean. After each line of pipe has been laid, carefully inspect, identify and remove dirt, trash, rags and other foreign matter from interior. Protect completed work.

H. Lay pipe with bell ends facing the direction of laying, against the direction of flow, unless otherwise shown on layout drawings.
   1. Where pipe is laid on a grade of ten percent or greater, start at bottom and proceed upward with bell ends of pipe upgrade.

I. Begin pipe laying from discharge end and proceed toward Pump Station with bell ends facing upstream, unless otherwise shown on layout drawings.

J. Install force mains with a minimum grade of one percent downhill slope away from sewage air release valve to force entrapped air to accumulate at air release valve, unless otherwise shown on layout drawings.

K. Install pipe, fittings, and accessories at the locations indicated on layout drawings and in accordance with manufacturer's instructions. Seal watertight.
   1. Polypropylene: Comply with ASTM D2774.

L. Lay pipe to slope gradients noted on layout drawings; with maximum variation from true slope of 1/8 inch in 10 feet.

M. Route piping in straight, true line.

N. Backfill trenches immediately after the pipe has been installed. Do not displace or damage pipe when compacting.

O. Connect to building sanitary sewer outlet and municipal sewer system, through installed sleeves.

P. Install trace wire 6 inches above top of pipe; coordinate with Section 312316.13.

3.05 JOINTING

A. Polypropylene (PP) Pipe:
   1. Heat Fusion Joints: Comply with manufacturer's instructions concerning equipment, temperature, melt time, heat coat, and joining time.

B. PVC Pipe:
   1. Screw Joints: Wrap male threads with joint tape or apply an approved thread lubricant, then threading the joining members together. Tighten joint with strap wrenches which will not damage pipe and fittings. Tighten joint no more than 2 threads past hand-tight.
   2. Push-On Joints: Bevel ends of pipe to facilitate assembly. Mark pipe to indicate when the pipe is fully seated. Lubricate gaskets to prevent displacement. Place gasket in proper position in bell or coupling while joint is made.
   3. Solvent-Weld Joints: Comply with manufacturer's instructions.

C. Polyethylene (PE) Pipe:
   1. Heat Fusion Joints: Comply with manufacturer's instructions concerning equipment, temperature, melt time, heat coat, and joining time.
   2. Installation of Mechanical Joints: Comply with manufacturer's instructions.
   3. Installation of Flanged Joints: Comply with manufacturer's instructions.

3.06 INSTALLATION - VALVES

A. Install in accordance with manufacturer's instructions.

B. Clean valves of foreign matter prior to installation and inspect for damage. Fully open and close valves to verify parts are properly operating.

3.07 DRAIN LINES

3.08 THRUST RESTRAINT

3.09 FIELD QUALITY CONTROL

A. Perform field inspection and testing in accordance with specifications.
   1. If tests indicate Work does not meet specified requirements, remove defective Work, replace and retest at no cost to Owner.
   2. Schedule tests to allow the Owner to witness the event.

B. Hydrostatic Tests
   1. Pipeline testing includes both a pressure test and a leakage test.
      a. Submit proposed method for disposal of waste water from hydrostatic tests to Owner for approval.
      b. Testing is the responsibility of the Contractor.
      c. Notify Owner at least seven days in advance of test date.
      d. Deliver the final test report to the Owner within 30 days of the test.
   2. Pressure Test: Test in accordance with manufacturer recommendations.
      a. After the pipe has been installed, joints completed, thrust restraints have been in place for at least five days, and the trench has been partially backfilled, leaving the joints exposed for examination, fill pipe with water to expel all air.
      b. Open and close each valve several times during the test.
      c. Examine exposed pipe, joints, fitting, and valves for leaks.
      d. Stop visible leaks or replace the defective pipe, fitting, joints, or valve.
   3. Retesting:
      a. If any deficiencies are revealed during any test, identify and correct deficiencies and reconduct tests and correct new deficiencies revealed until the results of the tests are within specified allowances, without additional cost to the Owner.

3.10 PROTECTION

A. Water is not permitted to run or stand in trench while pipe laying is in progress, before the joints are completely set, or before trench has been backfilled.

B. Protect pipe and bedding cover from damage or displacement until backfilling operation is in progress.

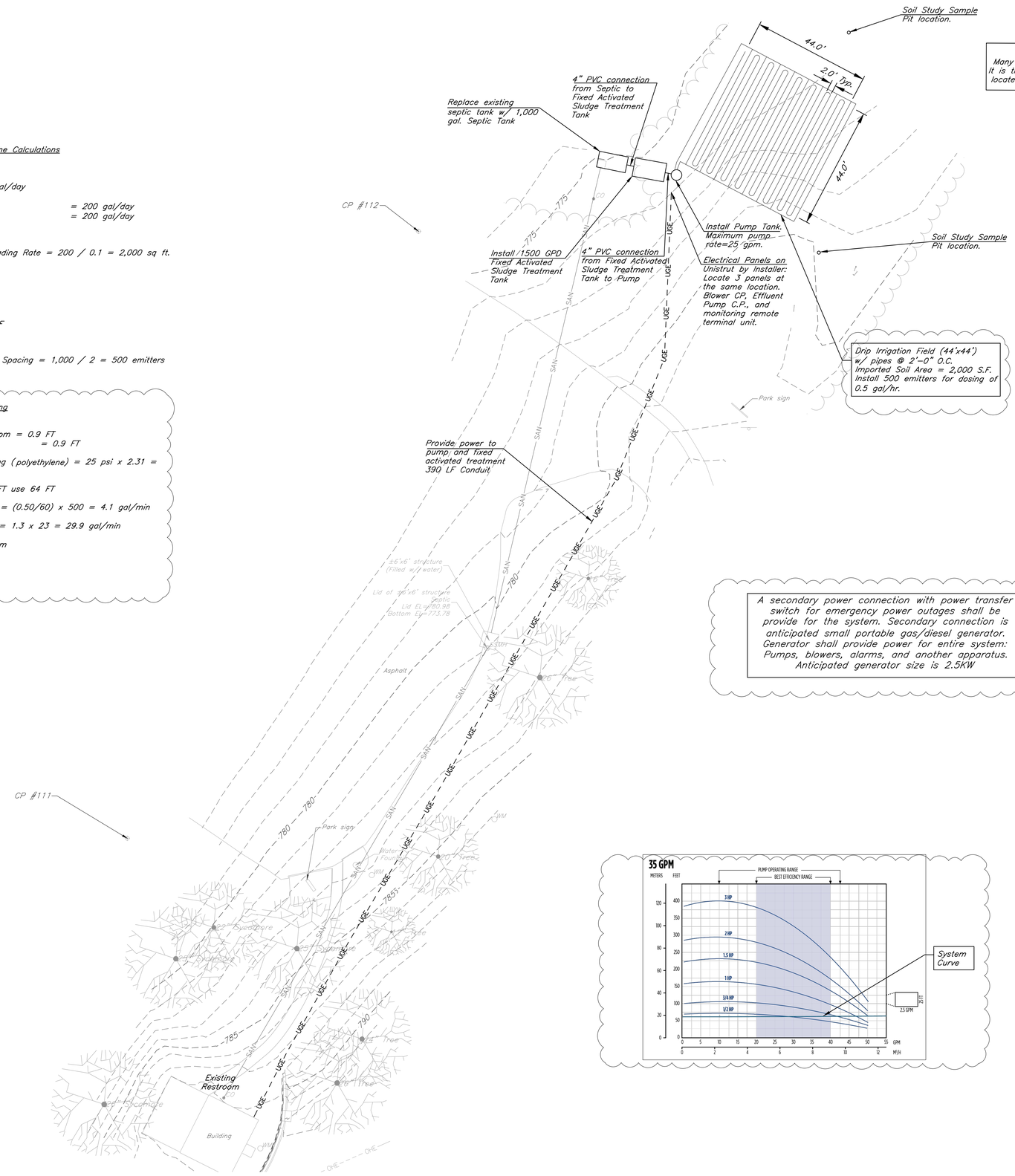
END OF SECTION

Field Sizing and Drip Line Calculations

1. Loading Rate = 0.1 gal/sq. ft * day
2. Ultimate Flow =
   Public Park Restroom = 40 persons x 5 gal/day
   = 200 gal/day
   Total Daily Flow: = 200 gal/day
   Design Ultimate Flow = 200 gal/day
3. Number of Zones = 1
4. Total Minimum Field Size = Total Daily Flow / Loading Rate = 200 / 0.1 = 2,000 sq ft.
5. Drip Line Spacing = 2 FT
6. Run Length = 43.5 FT
7. Total Number of Runs = 23
8. Total Lineal Feet of Line = 43.5 x 23 = 1,000 LF
9. Emitter Spacing = 2 FT on center
10. Total Emitters = Lineal FT of Drip Tubing/Emitter Spacing = 1,000 / 2 = 500 emitters

Effluent Pump Sizing

1. Static Head = 5 FT
2. Friction Loss = 5 FT of 1.25" HDPE pipe at 35 gpm = 0.9 FT
   Total = 0.9 FT
3. Operating Head = Required 25 psi in dispersal tubing (polyethylene) = 25 psi x 2.31 = 57.75 FT
4. Total Dynamic Head = 5 + 0.9 + 57.75 = 63.65 FT use 64 FT
5. Dosing Flow = (0.50 gal/hr) x Number of Emitters = (0.50/60) x 500 = 4.1 gal/min
6. Flushing Flow = 1.6 gal/min x Number of Laterals = 1.3 x 23 = 29.9 gal/min
7. Total Flow = 4.1 + 29.9 = 34 gal/min, use 35 gpm
8. Pump Requirements: 35 gpm and 64 FT TDH



A secondary power connection with power transfer switch for emergency power outages shall be provide for the system. Secondary connection is anticipated small portable gas/diesel generator. Generator shall provide power for entire system: Pumps, blowers, alarms, and another apparatus. Anticipated generator size is 2.5KW

REQUIREMENTS

1. Minimum area of 2,000 ft².
2. 1,000 LF of dispersal tubing placed 2 ft. O.C.
3. 23 Lengths at 44'.
4. Minimum of 500 emitters to be installed on a 2'x2' grid.
5. Supply line and return lines shall be installed at 8–10" below depth of dispersal tubing.
6. Dispersal tubing shall be installed 10" below finished grade.
7. Import 100± C.Y. soil for mound system.

Effluent Pumping:

Pump to utilize a 1/8" no vault filter/strainer integral with floats, submersible pump rated at (20) gpm. ½ Hp Thermoplastic pump 230V.
Float controls will be to start the pump and stop the pump based on and off float tips.
The High tide telemetry to record (Blower on, Pump run, and HWA.)

Imported soil:

Shall have an absorption rate of 0.1 GPD/SQFT
Imported soils must be a sandy to loamy material with less than 10% clay and less than 15% organic debris present. Contractor is responsible to acquire soil scientist approval of choice soil for use in a drip irrigation system in accordance with this plan, prior to filling.

Specifications for imported soils:

1. Physical characteristics that are uniform in texture, structure, and pore space. Imported Texture shall be sandy clay loam. Imported Structure type shall be Angular blocky or Subangular blocky or a combination of the two. Imported soil pore space shall be few and fine or common and fine.
2. Transportation methods for the soil shall ensures uniformity and consistency of the physical characteristics as close as possible to the original state upon delivery.
4. Contractor shall use methods for removal of organic layer prior to importing soil.
5. Imported soil shall not be compacted.
6. Placement of imported soil shall be in small lift increments of four to six inches.
7. Native soil is to be used for the vertical separation for the subsurface soil dispersal systems with the fill for the cap being imported soils. [10 CSR 20–8.110(7)(C)].
8. Remove existing sod prior to placing imported fill and stock pile onsite. Cover fill with removed sod.

Sanitary Sewer Note

Contractor to minimize sanitary sewer service impacts and shall coordinate with parks department any disruptions to service.

20' 0' 20' 40'
SCALE : 1 INCH = 20 FEET

Know what's below. Call before you dig.
Missouri One Call System
1–800–344–7483 (DIG–RITE) or 811

STATE OF MISSOURI
MICHAEL L. PARSON, GOVERNOR

STATE OF MISSOURI JONATHAN HEALY NUMBER PE-2010035126 10/9/24 PROFESSIONAL ENGINEER

GBA
9801 Renner Blvd., Ste. 300
Lenexa, KS 66219
913.492.0400
gbateam.com

OFFICE OF ADMINISTRATION
DIVISION OF FACILITIES MANAGEMENT,
DESIGN AND CONSTRUCTION

Department of Natural Resources Missouri State Parks

SEWER SYSTEM IMPROVEMENT

CROWDER STATE PARK
76 NW Highway 128
Trenton, MO

PROJECT # X232202
SITE # 5107
FACILITY # 7815107029

REVISION: Add.1
DATE: 10/9/24
REVISION:
DATE:
REVISION:
DATE:
ISSUE DATE: SEPT. 4, 2024

CAD DWG FILE:
DRAWN BY: DRV/JS
CHECKED BY:
DESIGNED BY: JRH

SHEET TITLE:

Sanitary Sewer - Lake Restroom

SHEET NUMBER:

C-103

SHEET 3 OF 6
SEPT. 4, 2024

Imported soil:

Shall have an absorption rate of 0.1 GPD/SQFT
Imported soils must be a sandy to loamy material with less than 10% clay and less than 15% organic debris present.
Contractor is responsible to acquire soil scientist approval of choice soil for use in a drip irrigation system in accordance with this plan, prior to filling.

Specifications for imported soils:

1. Physical characteristics that are uniform in texture, structure, and pore space. Imported Texture shall be sandy clay loam. Imported Structure type shall be Angular blocky or Subangular blocky or a combination of the two. Imported soil pore space shall be few and fine or common and fine.
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7. Native soil is to be used for the vertical separation for the subsurface soil dispersal systems with the fill for the cap being imported soils. [10 CSR 20-8.110(7)(C)].
8. Remove existing sod prior to placing imported fill and stock pile onsite. Cover fill with removed sod.

Imported Soil Type	Absorption Rate
Type I	0.5-0.4
Type II	0.4-0.2
Type III	0.3-0.15
Type IVa	0.2-0.05

Sanitary Sewer Note

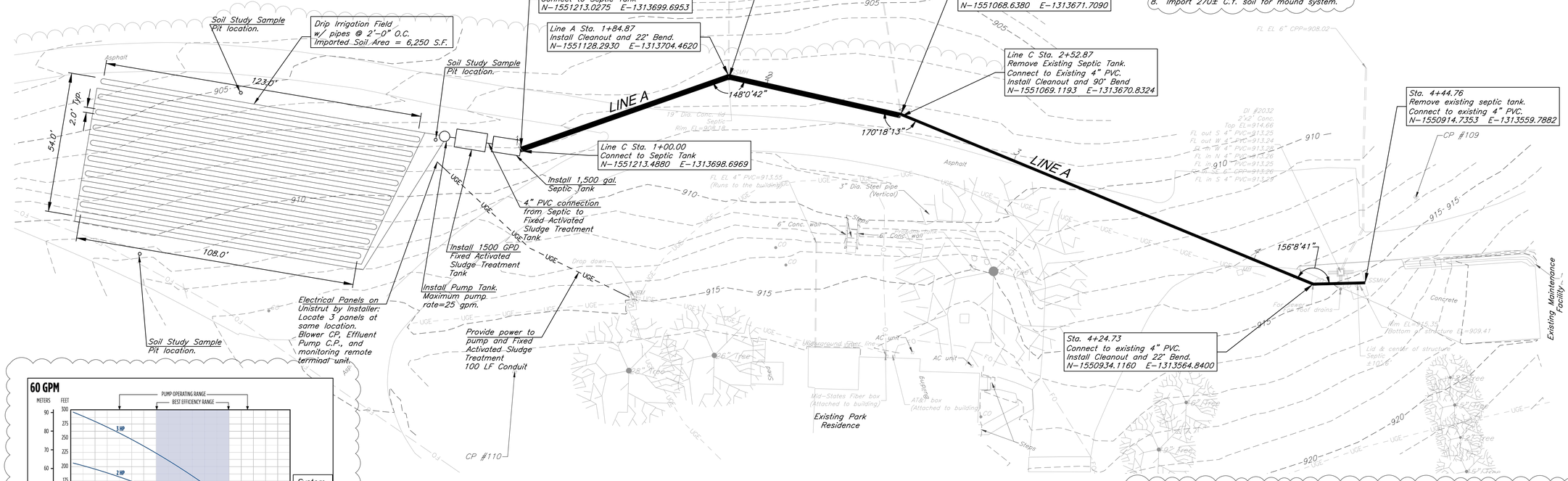
Contractor to minimize sanitary sewer service impacts and shall coordinate with parks department any disruptions to service.

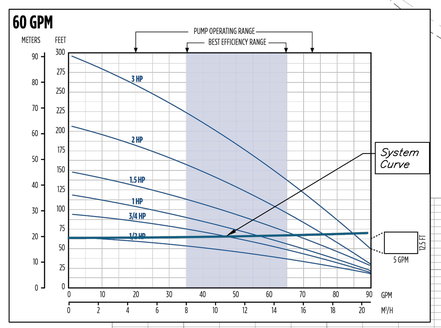
REQUIREMENTS

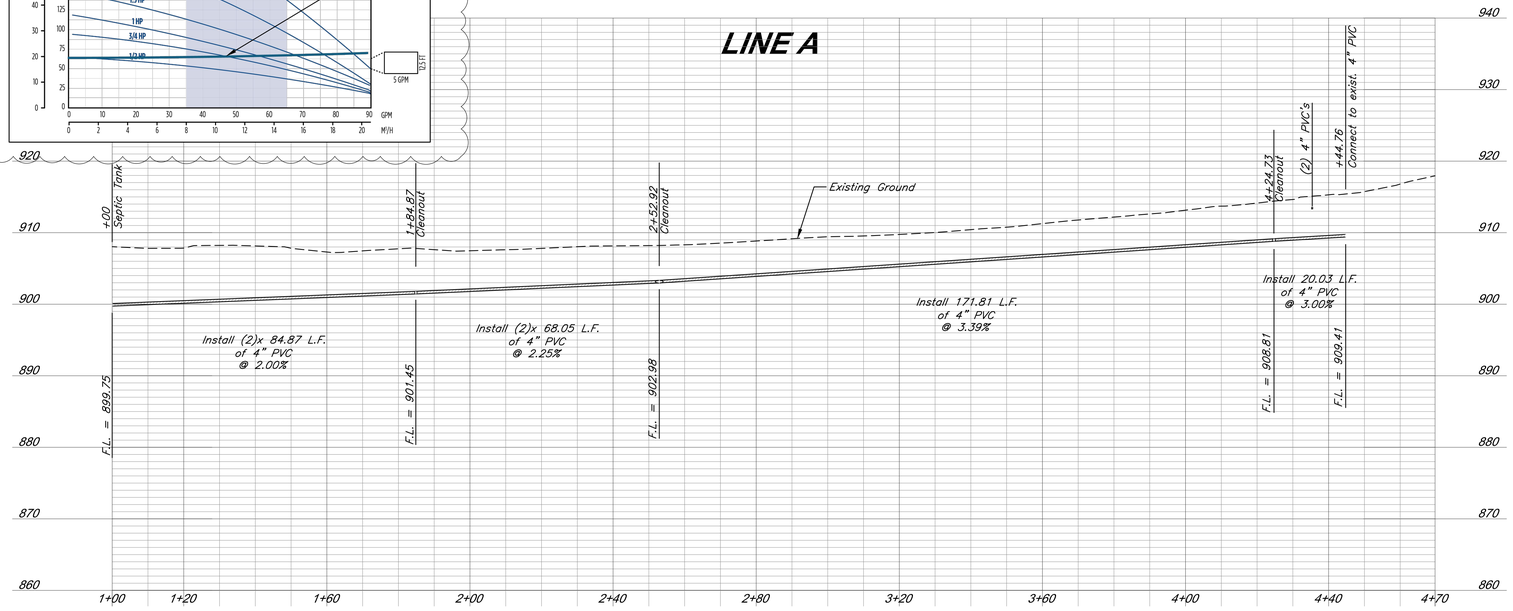
1. Minimum area of 6,250 ft².
2. 3,234 LF of dispersal tubing placed 2 ft. O.C.
3. 28 Lengths vary at 108' to 123'.
4. Minimum of 1558 emitters to be installed on a 2'x2' grid.
5. Supply line and return lines shall be installed at 8-10" below depth of dispersal tubing.
6. Dispersal tubing shall be installed at 10" below finished grade.
7. Contractor to pump out and remove existing septic tanks.
8. Import 270± C.Y. soil for mound system.

811 Know what's below. Call before you dig.
Missouri One Call System
1-800-344-7483 (DIG-RITE) or 811

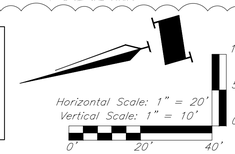
NOTE:
See sheet C-105 for details.







A secondary power connection with power transfer switch for emergency power outages shall be provide for the system. Secondary connection is anticipated small portable gas/diesel generator. Generator shall provide power for entire system: Pumps, blowers, alarms, and another apparatus. Anticipated generator size is 2.5KW



Field Sizing and Drip Line Calculations

1. Loading Rate = 0.1 gal/sq. ft * day
2. Ultimate Flow =
   Residential Single Family Restroom = 120 gal/day * 3 Bedrooms = 360 gal/day
   Service Station - 250 gal/day * 1 toilet = 250 gal/day
   Total Daily Flow: = 610 gal/day
   Design Ultimate Flow = 610 gal/day
3. Number of Zones = 1
4. Total Minimum Field Size = Total Daily Flow / Loading Rate = 610 / 0.1 = 6,100 sq ft.
5. Drip Line Spacing = 2 FT
6. Run Length = 122 FT average
7. Total Number of Runs = 26
8. Total Lineal Feet of Line = 122 x 26 = 3,172 LF
9. Emitter Spacing = 2 FT on center
10. Total Emitters = Lineal FT of Drip Tubing/Emitter Spacing = 3,172 / 2 = 1,586 emitters

Effluent Pump Sizing

1. Static Head = 5 FT
2. Friction Loss = 5 FT of 1.25" PVC at 25 gpm = 1.9 FT
   Total = 1.9 FT
3. Operating Head = Required 25 psi in dispersal tubing = 25 psi x 2.31 = 57.75
4. Total Dynamic Head = 5 + 1.9 + 57.75 = 64.66 FT Use Total Head 65 FT
5. Dosing Flow = (0.50 gal/hr) x Number of Emitters = (0.50/60) x 1,586 = 13.21 gal/min
6. Flushing Flow = 1.3 gal/min x Number of Laterals = 1.3 x 26 = 33.8 gal/min
7. Total Flow = 13.21 + 33.8 = 47 gal/min, use 50 gpm
5. Pump Requirements: 50 gpm and 65 FT TDH

STATE OF MISSOURI
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OFFICE OF ADMINISTRATION
DIVISION OF FACILITIES MANAGEMENT,
DESIGN AND CONSTRUCTION

Department of Natural Resources Missouri State Parks

SEWER SYSTEM IMPROVEMENT

CROWDER STATE PARK
76 NW Highway 128
Trenton, MO

PROJECT # X232202
SITE # 5107
FACILITY # 7815107029

REVISION: Add.1
DATE: 10/9/24
REVISION:
DATE:
REVISION:
DATE:
ISSUE DATE: SEPT. 4, 2024

CAD DWG FILE:
DRAWN BY: DRV/JS
CHECKED BY:
DESIGNED BY: JRH

SHEET TITLE:
Sanitary Sewer - Entry

SHEET NUMBER:
C-104

SHEET 4 OF 6
SEPT. 4, 2024