The Utilities Board City of Muscle Shoals

Materials and Installation Requirements for Potable Water Lines and Appurtenances and for Sanitary Sewer Lines and Appurtenances

1. PURPOSE OF THESE SPECIFICATIONS: The Utilities Board City of Muscle Shoals, Alabama, in many instances allows individual developers (hereinafter referred to as "Contractor") and other similar interests to install potable water and sanitary sewer collection and pumping facilities as a portion of the overall development requirements. All contractors must be currently licensed in the category "Municipal, Utility, and Work Incidental thereto." After such installations, should all components associated with the installations be those approved by the Board, and should proper workmanship be pursued when constructing such facilities, it is the normal policy of the Board to assume ownership of the potable water and sanitary sewer collection and pumping facilities improvements when such improvements are located within the defined service area of the Board. These specifications are intended to serve as general guidelines regarding the installation of such facilities, and may be amended by the Board as required to facilitate the integrity of installation, or the well being of the health and welfare of the general public.

2. PLANS OF PROPOSED FACILITES: All potable water lines and sanitary sewer collection lines and pumping stations shall be properly depicted and presented to the Board as scaled drawings, prepared by the developers certified engineer. Potable water line improvements shall be prepared at a scale of 1"=100' (or 1"=200' or other designated scale as may be required by the Board), and appurtenances and services that are proposed shall be clearly indicated. Sanitary sewer collection line improvements shall be prepared at a scale of 1"=50' for the "plan" portion of the drawings, and a scale of 1"=50' horizontal and 1"=5' vertical for the "profile" portion of the drawings. All sanitary sewer collection line improvements drawings shall clearly indicate manhole placements (spacing of no greater than 400 linear feet unless approved otherwise), inlet and outlet invert elevations, top of manhole elevations, line sizes, line slopes in percent, and carrying capacities (gallons per minute) of lines between manhole segments. All existing utilities (water, sewer, gas, power, telephone, cable, etc.) shall be clearly and legibly shown on all drawings, and the elevations of existing utilities shall be shown on all drawings, and the elevations of existing utilities shall be shown where proposed water or sanitary sewer lines are proposed to cross existing utilities. All elevations utilized shall be based on "mean sea level" elevations, and permanent bench marks shall be located and noted on the drawings for sanitary sewer lines such that the spacing between bench marks is not greater than 1,000 linear feet. All drawings shall be prepared by an agency approved by the Board, and all drawings shall clearly indicate the "north" direction. Prior to installation there will be a preconstruction meeting with developer/contractor and the Utilities Board representative.

3. RECORD DRAWINGS: Upon completion of construction of all work, as a condition prior to acceptance by the Board, the Contractor shall provide the Board with two (2) complete sets of drawings that depict "record" data, reflecting all components as constructed. Data shall show exact locations of all lines and appurtenances, and all service lines shall be clearly

marked, complete with reference dimensions such that the services can be easily located in the future.

4. EASEMENTS AND PROPERTY REQUIREMENTS: All easements and property requirements necessary for the proper installation and maintenance of potable water lines and sanitary sewer collection and pumping facilities shall be provided by the Contractor to the Board at no cost to the Board. Easements shall be dedicated to the Board as perpetual "utility easements", and all properties conveyed to the Board for pumping station sites, etc., shall be fee simple. All easements and properties intended for use shall be adequately described (complete with drawings as may be required) by a professional land surveyor duly registered to perform such work in the state of Alabama, with adequate property ties so as to clearly define the location of the easements and properties. The Board will determine the proper width of all easements required, based on depths of cut during construction, with consideration being also given to widths needed for proper access and maintenance during the ensuing years following completion of construction. The Board reserves the right to require the Contractor to provide additional easement widths in the form of "construction easements", in addition to the perpetual easements, as may be required to facilitate construction.

5. WARRANTY PERIOD: The Contractor shall be responsible for all operation and maintenance requirements associated with water lines and appurtenances, sewer collection lines and force mains and appurtenances, and sanitary sewer pumping stations and appurtenances for a period of one year following completion of construction, and subsequent acceptance by the Board. Warranty provided shall include all equipment, materials and labor at no cost to the Board, shall include restoration of surface areas due to erosion, including roadway surface (paving) repairs, and shall include "settling" of ditch lines due to inadequate compaction during construction. Upon completion of construction and acceptance by the Board the Contractor shall be provided a written "acceptance" by the Board. The one-year warranty period shall commence on the date of the written acceptance by the Board, or one year following the placement of the newly constructed facilities into service, whichever is the last to occur.

6. SAFETY: The Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the work continuously, 24 hours per day. Under the terms and conditions of these specifications, neither the Board, nor the Board's representatives, shall act as safety engineer or safety supervisor, since such responsibility remains solely with Contractor.

7. GENERAL REQUIREMENTS: All piping materials and accessories included in the work shall meet all applicable requirements of these Specifications. All materials and accessories shall be properly stored and shall be free of all dirt, debris and extraneous materials when installed. After careful inspection by the Board all defective piping materials and accessories shall be removed from the site of the work prior to installation. The Board shall be notified of any and all defective items discovered by the Contractor.

   All piping materials and related accessories and components shall be provided and installed by the Contractor. Items provided and installed shall include pipe, services, valves, fittings, couplings, valve boxes, indicators, gaskets, bolts, nuts, supports, hangers, clamps, blocks,

brackets, guides, bracing, piers, anchors, valve operators, extensions, stands, manholes and all other components necessary to place the entire installation in first class operating condition. All proper equipment and components necessary for suitable installation shall be provided by the Contractor. Any contractor who installs water or sewer mains must be licensed in the category "Municipal, Utility and Work Incidental thereto".

Ends of piping runs at the end of each workday shall be properly bulkheaded, blocked or plugged in an effort to keep the interior clean and free from all foreign matter. All foreign matter allowed to enter any portion of the piping shall be immediately removed from the piping.

8. WATER FACILITIES REQUIREMENTS

8.1. WATER SUPPLY LINES: Water supply lines shall be PVC Class 200 (AWWA approved), or Ductile Iron, Class 50 equivalent of new rating classifications, Tyton joint or mechanical joint as required by the Board, cement lined and coated. PVC pipe with a higher class rating may be required in some instances. All PVC piping installation shall include a "continuous" run of tracer wire, solid copper, tin-coated, not less than #12 gauge. The physical placement of the tracer wire in the construction trench shall be as directed by the Board. All supply lines shall meet AWWA standards.

8.2. SUPPLY LINE VALVES: Valves for 2" diameter supply lines shall be Clow or Equivalent, full port, resilient seat, short body gate valve. Valves for supply lines larger than 2" diameter shall be Mueller, M & H, Stockham or American brand, of construction and end connections as designated by the Board. The Board shall also determine if the valves are to be gate type or butterfly. All valves shall meet AWWA standards.

8.3. SUPPLY LINE FITTINGS: Fittings shall be fitted with mechanical joint end connections, and shall be ductile iron, compact, or cast iron. Fittings shall be cement lined and coated, and shall meet AWWA standards. Proper concrete bracing and blocking shall be provided for fittings that provide for a change in direction, all as required by the Board.

8.4. FIRE HYDRANTS: Fire hydrants shall be Mueller (5.25") main valve opening, with two hose nozzles and one pumper nozzle, dry top design. All hydrants shall "open left". All hydrant laterals shall be 6" diameter, and shall be fitted with an isolation valve. Proper blocking and bracing shall be utilized to provide a rigid installation, free of potential movement. Location and spacing of hydrant assemblies shall be in accordance with the requirements of the Muscle Shoals Utilities Board and Muscle Shoals Fire Marshall. All Fire hydrants will be installed to Final grade elevation.

8.5. WATER SERVICE LINES: Piping for water service lines shall be ¾" or 1" diameter Type K soft copper. Service line runs shall be free of joints between the pint of connection with supply main and the meter location. Corporations shall be ¾" or 1" Mueller brand, #H-15008. Service saddles for PVC supply mains shall be ¾" or 1" Dresser brand, Style 94, or shall be 2" I.P.T. Ford brand, double strap. Curb stops shall be ¾" or 1" Mueller brand, #B-24350-R Ball Stop.

8.6. EXCAVATION, TRENCHING AND BACKFILLING: All excavation trenching and backfilling shall be performed in accordance with the requirements of the Board, and in accordance with the requirements of the city of Muscle Shoals where applicable. All water supply lines shall be installed in accordance with the manufacturer of the piping utilized, and care shall be used in backfilling such that adequate compaction is achieved to prevent long-term settlement. Some PVC piping installations may require the use of special bedding and backfill material (other than native materials) to prevent damage to the piping materials. All water lines will have a minimum of 3 ft. of cover prior to testing.

8.7. TESTING: All line installations shall be properly tested upon completion of installation, after being properly flushed (the Board shall direct all flushing activities in an effort to prevent "muddy" water throughout the water distribution system). Test pressure shall be at a psi at least 75% of pipe rating, and the test pressure shall be monitored over a period of 6 continuous hours. After testing is completed, and if a pressure drop is indicated through out the test section, the line shall be filled to the initial test pressure with a known volume of water. The Board will make the determination if the line section tested is acceptable, or if additional work is required by the Contractor. All valves and fire hydrants will be installed at a finished grade elevation.

8.8. DISINFECTION: All water main installations shall be properly disinfected with 65% HTH as directed by the Board, and when installed. After proper flushing samples shall be delivered to a certified laboratory and tested for bacteria in accordance with the requirements of the Alabama Department of Environmental Management.

9. SANITARY SEWER LINES AND APPURTENANCES REQUIREMENTS
The following specifications are an amendment to the existing *Subdivision Regulations Article VI Required Improvements 1.6 Sanitary Sewers Amended-Construction Specifications* and will be enforced in conjunction with the above listed specifications.

9.1. SANITARY SEWER LINES: Gravity sanitary sewer lines shall be ductile iron, slip joint, Class 50 equivalent of new rating classifications, or PVC, gasketed joint, in accordance with the depth and terrain associated with line locations. Where PVC pipe is utilized, and the overall depth is 6'-0" of less and the pipe size is 6" diameter or greater, the pipe classification shall be S.D.R. 35. Where PVC pipe is utilized, and the overall depth is greater than 6'-0" and the pipe is 6" diameter or greater, the pipe classification shall be S.D.R. 26. Sanitary sewer force mains shall be ductile iron, Class 50 equivalent of new rating classifications, Tyton joint or mechanical joint as required by the Board, cement lined, and/or Protecto 401 lining or equivalent as required by the Board and coated. All lines will have a minimum of 3 ft. of cover prior to testing.

9.2. LATERALS AND FITTINGS: Sanitary sewer service laterals will be 4" diameter and shall be PVC Schedule 40. The Board will make the determination as to whether the joints of service lateral piping are gasketed or glued, and cleanouts shall be properly located in accordance with the requirements of the City of Muscle Shoals. Tee-wye-plug adapters used to connect service laterals to collection lines shall be PVC S.D.R. 35 or 26, spigot X Schedule 40 bell, solvent weld. Taps made to connect service laterals to existing vitrified clay collection lines shall include the use of a sewer saddle with

stainless steel strap or clamp to snugly fit the collection line. Inlet provided for service lateral shall be 4" diameter suitable for Schedule 40 PVC. Inlet must be created with a holesaw type device and will not be hammered out. The coupon to be provided to the Board upon request. Laterals will be marked with a metal post so a metal detector can be used to locate.

9.3. BEDDING MATERIAL: Bedding material utilized for sanitary sewer main and lateral installations shall be ADOT #78 Stone or #57 Washed Stone.

9.4. MANHOLE FRAMES AND COVERS: Manhole frames and covers shall be installed in a rigid manner, and shall be completely sealed with cementitious grout, inside and outside. All manhole frames and covers shall be installed with an approved surface water infiltration preventor. All manholes must be at final grade elevation prior to approval.

9.5. MANHOLES: Manholes shall be constructed of pre-cast concrete. Minimum diameter shall be 4'-0", and manhole assembly shall include base riser, intermediate riser(s) and cone section as required to provide a finished top of manhole elevation suitable for the respective location. All manholes shall receive a concrete grout "invert" finished smoothly so as to provide proper flow characteristics. Integrally-cast flexible rubber boot with stainless steel ring, or other suitable means of adequately connecting the sewer collection line to the manhole assembly, shall be provided as may be required by the Board. Rainguard inflow protectors will be installed in areas subject to storm water infiltration.

9.6. TESTING: All sanitary sewer lines and appurtenances shall be air tested in accordance with the requirements of the Board. All sanitary sewer lines shall be tested for deflection by a mandrel pull. All sanitary sewer lines and manholes shall be videoed showing locations of all stubs, with footage of stubs depicted from manholes. All manholes shall be vacuum tested according to the Boards. specifications

9.7. PUMPING STATIONS: All pumping stations, as may be required by the Board, shall be properly designed in accordance with the requirements of the Board, and shall be properly sized to accommodate all existing flows and future flows as dictated by the area or areas served. Contractor/developer will install connections for portable pump as specified by the Board.

10. ADDITIONAL REQUIREMENTS: The Board reserves the right to amend the requirements noted herein from time to time as may be deemed appropriate by the Board.

- All water and sewer lines will be at a minimum of three feet deep below final developed grade.
- All water and sewer main extensions will be extended to the property owner/developer farthest property line

11. LOW PRESSURE SEWER SYSTEMS AND APPURTENANCES

11.1 GENERAL

11.1.1 PURPOSE: This Section establishes minimum planning, design, material, installation, testing, acceptance, ownership, and operation requirements for low pressure sewer systems serving property within the service area of the Muscle Shoals Utilities Board (Board or MSUB). This Section replaces the former Section 11, Low Pressure Septic Tank Effluent Pump (STEP) Sewer Systems and Appurtenances Requirements, in its entirety.

11.1.2 APPROVED ALTERNATIVE: A low pressure sewer system is an approved alternative only when specifically authorized in writing by the Board. Gravity sewer shall remain the preferred method of service. Low pressure sewer may be considered where gravity sewer and a conventional centralized lift station are impractical, uneconomical, or otherwise not in the Board's best interest. Approval on one project does not establish approval for another project. The Board may require that new developments be served by a combination of gravity sewers and low pressure sewers.

11.1.3 PREDESIGN CONFERENCE: Before preparing final plans, the Developer and its Engineer shall meet with the Board to confirm the service area, ultimate buildout, ownership limits, discharge location, design criteria, required easements, and any project-specific conditions.

11.1.4 SYSTEM STANDARDIZATION: All low pressure sewer mains and pressure service laterals shall be PE4710 HDPE, DR 11. Nominal sizes 3 inches and smaller shall be IPS; nominal sizes 4 inches and larger shall be DIPS. Fittings, valves, saddles, fusion equipment, and transitions shall match the pipe outside diameter system and DR. Grinder pump stations shall be Environment One Corporation (E/One) equipment as specified herein. Substitutions are not permitted unless approved in writing by the Board before design approval and material purchase.

11.1.5 APPLICABLE REQUIREMENTS: These requirements supplement the other provisions of the Board's Materials and Installation Requirements. In the event of a conflict, the more stringent requirement shall apply unless the Board directs otherwise in writing. The work shall also comply with permits, applicable Alabama Department of Environmental Management requirements, the adopted plumbing and electrical codes, rights-of-way requirements, and the pump and pipe manufacturers' written instructions.

11.1.6 BOARD AUTHORITY: The Board may modify, waive, or impose additional requirements when site conditions, system size, operating pressure, receiving sewer conditions, public health, constructability, or future operation and maintenance warrant a project-specific requirement. Deviations shall be requested in writing and shall include the Engineer's technical justification.

11.2 DEFINITIONS

Term	Definition
Board or MSUB	The Muscle Shoals Utilities Board and its authorized representatives.
Developer	The property owner, developer, or other entity responsible for design, permitting, construction, and dedication of the proposed improvements.
Engineer	A professional engineer currently licensed in Alabama and responsible for the low pressure sewer design and construction certification.
Low Pressure Sewer (LPS) System	Two or more grinder pump stations discharging through pressure laterals to a common pressure sewer main, including all public and private components.
Grinder Pump Station	A factory-fabricated E/One station consisting of the tank, pump core, internal piping and check valve, level controls, accessway, cover, alarm/control panel, and related accessories.
Private Pressure Lateral	The pressure pipe from the grinder pump station to the upstream connection point of the public service connection assembly in the service box.
Public Service Connection	The Board-owned facilities beginning at the pump-side connection of the E/One Uni-Lateral assembly within the service box and including the complete Uni-Lateral assembly, service box, public service branch piping, electrofusion fittings, and connection to the public LPS main.
Public LPS Main	The common pressure sewer main serving more than one property, including inline valves, air valves, flushing assemblies, transition manholes, and other accepted public appurtenances.
Service Box	The accessible enclosure at the public-private ownership boundary and containing the complete E/One Uni-Lateral assembly, tracer wire access point, and associated service connection.
Transition Manhole	A corrosion-protected manhole specifically configured to receive the LPS discharge and transition flow into a gravity sewer.

11.3 RESPONSIBILITIES AND OWNERSHIP

11.3.1 DEVELOPER ENGINEER: The Developer and Engineer are responsible for the complete system design through ultimate buildout, required permits and approvals, easements and property documents, construction, testing, startup, record information, warranty administration, and delivery of owner instructions. Board review does not relieve the Engineer of design responsibility.

11.3.2 CONTRACTOR: The Contractor shall furnish and install a complete and operable system; protect all work until acceptance; coordinate inspections and manufacturer services; correct defective work; and satisfy the warranty requirements of these Specifications. The Contractor shall be currently licensed in Alabama for Municipal, Utility, and work incidental thereto.

11.3.3 BOARD-OWNED FACILITIES: After written acceptance and proper dedication, the Board will own and maintain the public LPS main and its appurtenances and each public service connection through and including the service box assembly. The Board assumes no responsibility for facilities outside an accepted right-of-way or easement.

11.3.4 PROPERTY OWNER FACILITIES: The property owner shall own, power, operate, maintain, repair, and replace the grinder pump station, control/alarm panel, electrical service, building gravity sewer, and private pressure lateral from the station to the designated connection point in the service box. The property owner shall not operate or modify Board-owned valves or appurtenances.

11.3.5 OWNERSHIP BOUNDARY: The plans and the applicable standard detail shall identify the exact public-private ownership boundary. Unless the Board approves otherwise, the private pressure lateral terminates at the upstream adapter or connection provided within the service box, and the public service connection begins at that point.

11.3.6 EASEMENTS AND ACCESS: Public mains and appurtenances shall be located in public rights-of-way or perpetual utility easements conveyed to the Board at no cost. The service box shall be accessible to Board personnel at all times. Landscaping, fences, structures, pavement, transformers, or other obstructions shall not be placed over or within the required working area of a service box or public appurtenance.

11.4 DESIGN SUBMITTALS AND REFERENCE STANDARDS

11.4.1 SUBMITTAL TIMING: Signed and sealed plans, specifications, hydraulic design report/calculations, and supporting information shall be submitted to the Board at least 60 days before proposed material purchase or construction. No construction or permanent material purchase shall begin until written approval is issued.

11.4.2 PLANS: At a minimum, the construction drawings shall show:

a. The LPS service area, ultimate tributary limits, phasing, lot count, and each proposed or future station.

b. Plan and profile of every public main and pressure lateral, including nominal pipe size, IPS or DIPS dimensional basis, material, DR, stationing, ground elevations, cover, crossings, high and low points, discharge elevation, and limits of public and private ownership.

c. Service boxes, fused service branches, inline isolation valves, flushing assemblies, air valves, transition manholes, receiving gravity sewer, and corrosion protection.

d. Existing and proposed utilities, roads, drainage improvements, finished grades, easements, property lines, and required separations.

e. Standard detail references, project-specific details, test sections, proposed flushing-water source, discharge and disposal provisions, and connection sequencing.

11.4.3 HYDRAULIC DESIGN REPORT: The Engineer shall submit a system-wide hydraulic model or calculation package that includes:

a. Average and peak wastewater flow assigned to each property and the basis for nonresidential flow estimates.

b. The number of simultaneously operating pumps determined using the latest E/One pressure sewer design method or software. Use 11 gpm per operating E/One pump for main sizing unless a different value is justified by the selected pump and approved by the Board.

c. Calculations for initial phase and ultimate buildout conditions, including minimum-flow branches, maximum simultaneous operation, static head, friction loss, pump operating points, minimum and maximum velocity, maximum pressure, and available flushing velocity. Use the actual inside diameter corresponding to the specified nominal size, IPS or DIPS, and DR 11.

d. Hazen-Williams friction calculations using C = 130 for HDPE. The pump elevation used for static head shall be the proposed pump-off elevation.

e. Evaluation of air or vacuum conditions, wastewater detention, septicity, odor and corrosion potential, receiving gravity sewer capacity, and the need for air valves or odor-control provisions.

11.4.4 PRODUCT SUBMITTALS: Submit complete product data for grinder pump stations, tanks, covers, controls, alarm panels, generator connections where required, HDPE pipe and fittings, fusion equipment, valves, checks, flushing assemblies, service boxes, tracer wire, warning tape, air valves, coatings, and transition manholes. Product data shall identify proposed options and shall not consist of unmarked general catalogs. Pipe and fitting submittals shall identify nominal size, IPS or DIPS, actual outside diameter, DR, pressure rating, and compatibility of all connected components.

11.4.5 REFERENCE STANDARDS: Apply the latest adopted edition of the following standards unless the Board approves otherwise:

a. ASTM D3035 for IPS pipe 3 inches and smaller; ASTM F714 and AWWA C906 for DIPS pipe 4 inches and larger; ASTM D3350 for PE material classification; and ASTM D3261 for molded butt-fusion fittings.

b. ASTM F2620 for heat-fusion joining; ASTM F1055 for electrofusion fittings; ASTM F2164 for field leak testing of polyethylene pressure piping.

c. Plastics Pipe Institute TR-33 for generic butt-fusion procedures and TN-46 for field pressure testing of polyethylene pressure piping.

d. NFPA 70, National Electrical Code; applicable building and plumbing codes; and E/One's current written design, installation, and startup requirements.

11.5 SYSTEM DESIGN CRITERIA

11.5.1 SERVICE BASIS: Provide a separate grinder pump station and pressure lateral for each single-family dwelling, including each dwelling unit of a duplex, unless the Board specifically approves a shared station. Apartment, multi-family, institutional, commercial, and industrial service shall be individually engineered. A standard WH101 station shall not be assigned more than 700 gallons per day without written concurrence from E/One and the Board.

11.5.2 PIPE SIZE: Private pressure laterals and public service branches shall be at least 1-1/4 inches nominal diameter. Public LPS mains shall be at least 2 inches and normally no larger than 6 inches unless approved by the Board. Nominal sizes 3 inches and smaller shall be IPS DR 11; nominal sizes 4 inches and larger shall be DIPS DR 11.

11.5.3 VELOCITY: Size the system for a minimum calculated velocity of 2.0 feet per second at peak simultaneous pumping conditions. The preferred maximum velocity is 5.0 feet per second. Velocity greater than 8.0 feet per second is not permitted without written Board approval and an evaluation of surge, fittings, and appurtenances. Each segment shall be capable of being flushed at not less than 2.0 feet per second.

11.5.4 PRESSURE AND PUMP OPERATING RANGE: The calculated operating point for every station shall fall within the published E/One pump curve for all approved phases. Calculated total dynamic head shall not exceed 185 feet (80 psi) or 90 percent of the manufacturer's maximum allowable head, whichever is less, unless E/One and the Board approve otherwise in writing. System components shall be rated for maximum static, operating, surge, and test pressures.

11.5.5 ALIGNMENT AND PROFILE: Lay mains and laterals in straight alignment and on a uniform profile where practical. Design a continuously rising profile toward the discharge when site grades allow. Avoid unnecessary high points, low points, abrupt vertical changes, and serpentine routing. Use long-radius fused fittings; individual bends greater than 45 degrees are not permitted unless shown and justified on the approved plans.

11.5.6 COVER: Provide at least 4 feet of cover over all public LPS mains. Maintain the required main cover at each service saddle and branch connection. After leaving the main trench, the public service lateral shall transition to 3 feet of cover. Within 5 feet of the service box, the public service lateral shall rise 18” of cover at the service box assembly. Make vertical transitions by bending the service lateral piping, not to exceed the manufacturers’ recommended minimum bend radius. Mechanical elbows and buried mechanical joints are prohibited. Provide additional cover, casing, or structural protection at roads, drainage features, utility crossings, and other locations required by the Board.

11.5.7 EXTENSIONS: Extend public LPS mains and required appurtenances to the farthest property line or other limit directed by the Board to permit orderly future extension. Temporary dead ends shall be provided with a flushing assembly and a restrained, fused end closure.

11.5.8 RECEIVING SEWER: The Developer’s Engineer shall confirm and/or provide all requested information to the Board to confirm that the receiving gravity sewer, manholes, downstream pump stations, and treatment facilities can accept the proposed flow. The Engineer shall evaluate sulfide, odor, turbulence, and corrosion impacts at the discharge and downstream.

11.6 GRINDER PUMP STATIONS

11.6.1 STANDARD RESIDENTIAL STATION: Unless otherwise approved, the standard station for one single-family residence shall be Environment One Corporation Extreme Series Model WH101, hardwired, simplex, open wetwell grinder pump station utilizing the manufacturer’s current Universal Wet Well with integrated ballast design. The complete station shall be furnished by E/One as an integrated package. An assembled package composed of components from multiple manufacturers is not acceptable.

11.6.2 COMPLETE PACKAGE: The WH101 station shall be furnished as a complete, factory-built and tested E/One package consisting of the Extreme Series semi-positive-displacement grinder pump core; integral level sensing; internal check valve and discharge piping; corrosion-resistant HDPE open wetwell tank with manufacturer-integrated anti-flotation provisions; factory-furnished cover and integral vent assembly; electrical quick disconnect; factory wiring; control and alarm panel; inlet and discharge connections; lifting provisions; and all accessories required for a complete and operable installation. All components shall be furnished or approved by E/One and shall be compatible with the selected station.

11.6.3 CAPACITY: The WH101 station shall provide approximately 100 gallons of tank capacity and shall be rated for up to 700 gallons per day. Larger residential, commercial, institutional, or shared-flow applications shall use an E/One station model selected by the Engineer and approved by the Board. Duplex equipment shall be provided where the design flow exceeds simplex capacity, where interruption would create a material public-health risk, or where required by the Board.

11.6.4 PUMP PERFORMANCE: The standard pump shall be a 1-horsepower, 1,725-rpm, 240-volt, single-phase, high-torque, thermally protected E/One Extreme Series grinder pump. Published performance is approximately 15 gpm at 0 psi, 11 gpm at 40 psi, and 7.8 gpm at 80 psi. The pump shall operate throughout the approved system range without motor overload or damage.

11.6.5 GRINDER AND PUMP CORE: The grinder shall reduce normal domestic wastewater solids to particles that pass through the pump, check valves, and 1-1/4-inch piping. Wear and cutting components exposed to wastewater shall be corrosion resistant. The complete pump core shall be removable and replaceable from grade without personnel entering the station.

11.6.6 TANK AND ACCESSWAY: The tank and integral accessway shall be HDPE, watertight, corrosion resistant, and designed for the burial depth, saturated soil load, and hydrostatic pressure shown. Penetrations shall be factory-provided or made only with manufacturer-approved fittings and procedures.

11.6.7 COVER: Provide a factory-furnished, lockable, nontraffic-rated cover with the manufacturer’s integral vent. The cover assembly shall minimize entry of surface water while maintaining unrestricted station ventilation. The integral vent shall remain above finished grade and shall not be blocked, sealed, reduced, or modified. Grinder pump stations shall not be installed in pavement or vehicular areas unless the Board approves the traffic-rated station, cover, structural design, and manufacturer-approved venting arrangement.

11.6.8 LOCATION AND GRADE: Locate each station on the property it serves, outside buildings unless specifically approved, and where it remains accessible for pump-core removal. Do not locate beneath driveways, parking, decks, porches, HVAC equipment, retaining walls, transformers, planned structures, or behind fences. Provide at least 3 feet of clear working area around the cover and unobstructed vertical access. Set the cover 3 to 6 inches above final grade and slope surrounding grade away from the station. Top to be above areas subject to being flooded.

11.6.9 BUOYANCY AND FLOODING: Install the WH101 Universal Wet Well and its manufacturer-integrated anti-flotation provisions in accordance with E/One's requirements for the burial depth, soil conditions, and highest anticipated groundwater elevation. Do not field-modify the tank or provide additional ballast, anchorage, or concrete encasements unless required or approved in writing by E/One and shown on the approved plans. Where the applicable flood elevation may submerge the standard cover or integral vent, provide an E/One WH101F or other Board-approved flood-rated E/One station. Locate the control panel and other electrical equipment above the applicable flood-protection elevation.

11.6.10 GRAVITY INLET AND VENTING: The building sewer entering the station shall be at least 4 inches in diameter and shall comply with Section 9, the applicable plumbing code, and E/One's inlet requirements. Locate the inlet at the elevation shown on the approved plans and in a manner that preserves the manufacturer's required operating, alarm, and storage volumes. The WH101 station shall be vented through the manufacturer's integral cover vent. The building plumbing system shall be independently vented as required by code and shall not be relied upon as the sole vent for the station. Alternative station-venting arrangements require written approval from E/One and the Board. Stormwater, foundation drains, roof drains, sump pumps, and other sources of inflow are prohibited.

11.7 CONTROLS, ALARMS, AND ELECTRICAL

11.7.1 FACTORY CONTROLS: Controls, level sensing, motor starting components, alarm panel, cables, and connectors shall be furnished or approved by E/One and shall be compatible with the selected station. Field-fabricated control logic and third-party level controls are not acceptable.

11.7.2 CONTROL AND ALARM PANEL: Provide a UL-listed outdoor panel in a corrosion-resistant NEMA 4X enclosure with lockable or secured access. Provide automatic pump control, manual run/test function, circuit protection, visual high-water alarm, audible high-water alarm, alarm silence, and the manufacturer's standard service indications. The visual alarm shall remain active until the alarm condition clears.

11.7.3 LOCATIONS: Mount the panel on the exterior of the served building or on an approved freestanding support in clear view of the station. Maintain the cable length and separation limits required by E/One. The panel shall remain accessible and shall not be concealed by fences or landscaping.

11.7.4 ELECTRICAL SERVICE: Provide a dedicated 240-volt, single-phase, 30-ampere branch circuit unless the selected E/One station requires otherwise. Provide a code-compliant disconnect within sight of and not more than 10 feet from the station or panel, as applicable. Work shall be completed by a licensed electrician and inspected by the authority having jurisdiction. Electrical penetrations and underground cable connections shall be watertight; underground splices are prohibited unless furnished as part of the approved E/One system.

11.7.5 EMERGENCY POWER CONNECTIONS: Where required by the Board or shown on the approved plans, provide the E/One factory-approved portable-generator receptacle and manual transfer device. A connection that can inadvertently backfeed the utility electrical system is prohibited.

11.7.6 OWNER INSTRUCTIONS: Permanently post the pump-alarm response instructions and local authorized service contact information at or inside the control panel. Electrical power shall remain on whenever the building is occupied or wastewater may enter the station.

11.8 PRIVATE PRESSURE LATERALS

11.8.1 PIPE: The private pressure lateral from each grinder pump station to the service box shall be 1-1/4-inch minimum IPS PE4710 HDPE, DR 11, with permanent green identification stripes. PVC pressure pipe is not permitted. Pipe size shall not be smaller than the station discharge and shall be increased where shown by the approved hydraulic design.

11.8.2 ROUTING: Provide one dedicated pressure lateral for each station. Route the lateral entirely within the property served and the approved easement corridor. A lateral shall not cross an adjacent parcel or serve a second property unless specifically approved and covered by recorded easements and ownership documents.

11.8.3 LOCATION: Place the lateral outside driveways, parking areas, transformer pads, retaining walls, and planned structures. A long-side lateral crossing a street shall be installed by an approved trenchless method or within a PVC casing extending between the limits directed by the governing roadway agency and the Board.

11.8.4 JOINING: Join HDPE by butt fusion or electrofusion. Use fused long-radius fittings for changes in line or grade. Mechanical couplings, solvent-welded adapters, hose connections, barbed fittings, and mechanically clamped service saddles are not permitted except at accessible equipment and valve transitions specifically shown on the standard details.

11.8.5 CHECK VALVES AND ISOLATION: Provide two independent check valves for each service: the factory check valve within the WH101 station and the check valve incorporated into a complete 1-1/4 inch E/One stainless-steel Uni-Lateral assembly located within the service box. Install the Uni-Lateral assembly horizontally, in the direction of flow, with approximately 18” of cover below finished grade. Locate all valves, cleanouts, adapters, and mechanical connections completely within the service

box and make them accessible for operation, inspection, maintenance, and replacement without excavation. Purge entrapped air through the cleanout before placing the service into operation.

11.8.6 IDENTIFICATION: Install tracer wire and warning tape continuously along the private lateral and terminate the tracer wire accessibly in the grinder station area and service box. Include the lateral alignment, station, and service-box coordinates in the record information.

11.9 PUBLIC LPS MAINS AND SERVICE CONNECTIONS

11.9.1 MAIN PIPE: Public LPS mains shall be PE4710 HDPE, DR 11. Mains 3 inches and smaller shall be IPS; mains 4 inches and larger shall be DIPS. Public service branch piping shall be 1 1/4 inch minimum IPS PE4710 HDPE, DR 11. Use pipe sizes shown on the approved plans. Pipe shall be furnished with green stripes and in the longest practical lengths and joined into a continuous fused system.

11.9.2 LOCATION: Locate public mains in public street rights-of-way whenever practical. Off-right-of-way mains shall be centered within a perpetual utility easement of width approved by the Board. Provide all-weather access to public appurtenances where directed.

11.9.3 SERVICE BRANCHES: Connect each 1-1/4 inch IPS service branch to the main using a PE4710 electrofusion branch saddle specifically manufactured for the nominal main size, actual main outside diameter – IPS or DIPS – DR 11, and a 1-1/4 inch IPS PE outlet. The fitting pressure rating shall be not less than that of the connected pipe. Install and cool the fitting in accordance with the fitting and fusion equipment manufacturers' instructions. Tap the main only after the required cooling period using manufacturer approved tooling; retain the coupon and prevent cuttings from entering the main. Mechanically clamped saddles are prohibited unless specifically shown and approved by the Board.

11.9.4 SERVICE BOX LOCATION: Install the service box at the public-private ownership boundary, approximately 1' behind the Utility Easement. Unless the Board directs otherwise, locate the box approximately 6 feet from the side lot line and outside driveways, sidewalks, drainage swales, and transformer clearances.

11.9.5 MAIN ISOLATION: Provide full-port isolation valves at branch-main intersections, at locations needed to isolate system zones, on each side of major roadway or waterway crossings when directed, and at intervals not exceeding 1,000 feet. Arrange valves so that the smallest practical portion of the system can be isolated without interrupting the entire development.

11.9.6 FLUSHING ASSEMBLIES: Provide flushing assemblies at each permanent or temporary upstream dead end, at intervals not exceeding 1,000 feet on long runs, and at other locations required by the hydraulic analysis or the Board. Except at a terminal-end assembly, connect the flushing assembly to the LPS main using a factory fabricated PE4710 DR 11 butt fusion wye matching the nominal size and

outside diameter system of the main. Orient the wye so flushing water enters the main in the downstream direction. Reduce the wye branch to 2-inch IPS PE4710 DR 11 fusing pipe using a factory-manufactured reducer. Omit the reducer on 2-inch LPS mains. Locate the flushing wye immediately downstream of the mainline isolation valve. Terminate each assembly in an accessible, lockable box or vault with a full port corrosion resistant isolation valve, approved quick connection, and restrained cap.

11.9.7 AIR VALVES: Provide 2-inch combination sewage air-release/air-vacuum valves, BERMAD Model C50-SP-P, or approved equal, only at hydraulic high points where the hydraulic analysis demonstrates a need and the Board approved the location. Connect each assembly at the crown of the main using a 2-inch electrofusion transition saddle with Type 316 stainless steel female NPT outlet, specifically sized for the exact nominal main size, IPS or DIPS outside diameter, and DR 11. Provide each air valve with a full-port isolation valve and manufacturer-furnished flushing and drainage ports. Install the valve vertically within a vented, open bottom precast concrete doghouse manhole in accordance with the standard detail. Locate the structure outside drainage swales and depressions, set the rim at surrounding grade, and mount the air valve as high as practicable. The enclosure shall not be connected to a storm drain or other piping system. Where odor control is directed by the Board, the odor-control assembly shall not restrict the valve's required air-release or vacuum-admission capacity.

11.9.8 DISCHARGE: Discharge a public LPS main only to another approved LPS main or to an approved gravity sewer transition manhole. Direct connection to gravity sewer pipe is prohibited. A dedicated transition manhole is required when the LPS system serves three or more stations or exceeds 1,000 feet in length and may be required for smaller systems at the Board's discretion.

11.9.9 TRANSITION MANHOLE: Configure the force-main entry to direct flow smoothly into the outgoing channel without uncontrolled splash or impingement. Coat the transition manhole with a Board-approved corrosion-resistant lining. Unless the Engineer demonstrates that it is unnecessary, similarly protect the first downstream manhole and any noncorrosion-resistant gravity pipe between them. Provide access for sampling, flushing, and maintenance as directed.

11.10 HDPE PIPE, FITTINGS, AND FUSION

11.10.1 RESIN: Pipe and pressure fittings shall be manufactured from virgin PE4710 material meeting ASTM D3350 with a cell classification appropriate for PE4710 pressure pipe. Rework material from sources other than the manufacturer's own production of the same formulation is prohibited.

11.10.2 DIMENSIONS AND PRESSURE CLASS: Pipe 3 inches and smaller shall be IPS DR 11 and conform to ASTM D3035. Pipe 4 inches and larger shall be DIPS DR 11 and conform to ASTM F714 and AWWA C906. Fittings shall match the nominal size, actual outside diameter system, material, and DR of the connected pipe and shall have a pressure rating not less than that of the pipe. Where a size change crosses the 3-inch/4-inch dimensional boundary, provide a factory manufactured approved IPS to DIPS transition fitting.

11.10.3 IDENTIFICATION AND CERTIFICATION: Pipe shall be permanently marked with manufacturer, nominal size, IPS or DIPS dimensional designation, actual outside diameter, material designation, DR, pressure rating, applicable standard, production

code, and green sewer identification stripes. Submit resin certification, pipe production certification, and lot traceability before installation.

11.10.4 BUTT FUSION: Perform butt fusion in accordance with ASTM F2620, PPI TR-33, and the pipe manufacturer's written procedure using equipment capable of recording joint parameters. Fusion equipment shall use inserts sized for the actual pipe outside diameter. Fusion operators shall be currently qualified for the equipment, procedure, material, nominal size, IPS or DIPS dimensional basis, and DR being joined.

11.10.5 ELECTROFUSION: Electrofusion fittings shall comply with ASTM F1055 and be installed by qualified personnel using compatible, calibrated equipment. Each fitting shall be listed for the exact pipe material, nominal size, actual IPS or DIPS outside diameter, and DR. IPS and DIPS fittings of the same nominal size are not interchangeable. Scraping, cleaning, restraint, cooling, and barcode or fitting data entry shall follow the fitting manufacturer's instructions. Submit an electronic or printed fusion record for every electrofusion joint.

11.10.6 FUSION QUALITY: Beads shall be uniform and visually acceptable. Cut out and replace incomplete, misaligned, contaminated, overheated, or otherwise questionable joints. Fusion joints shall not be repaired by extrusion welding, adhesives, clamps, or mechanical patches. The Board may require destructive bend testing of trial or production joints at the Contractor's expense.

11.10.7 MECHANICAL TRANSITIONS: Mechanical transitions are permitted only at accessible valves, pump stations, service boxes, flushing assemblies, air valve assemblies, and other locations shown in the standard details. Use restrained transition fittings designed specifically for PE4710 HDPE, the exact IPS or DIPS outside diameter, DR 11, and the full test pressure. Provide internal stiffeners, glands, gaskets, and restraint recommended by the transition fitting manufacturer. Mechanical joint adapters intended for DIPS pipe shall not be installed on IPS pipe. Buried mechanical joints shall not be used as a substitute for fusion.

11.11 VALVES, BOXES, AND IDENTIFICATION

11.11.1 MAINLINE VALVES: Unless otherwise shown, provide ductile-iron, nonrising-stem, resilient-seated gate valves with mechanical joint ends on all 2-inch and larger LPS mains. Valves shall conform to AWWA C509 or AWWA C515 as applicable. Connect each valve to the HDPE main using factory manufactured PE4710 DR 11 mechanical joint adapters specifically sized for the nominal pipe size and actual outside diameter system: IPS For 2-inch and 3-inch mains and DIPS for 4-inch and larger mains. Furnish all glands, gaskets, internal stiffeners where required, and restraint recommended by the valve and adapter manufacturers. Mechanical joint adapters intended for DIPS pipe shall not be installed on IPS pipe. Provide fusion bonded epoxy coating in accordance with AWWA C550, a 2-inch square operating nut, extension operator where required, and an adjustable cast iron valve box set to finished grade with a cover marked “Sewer”. Alternative valve types require Board approval.

11.11.2 VALVE BOXES: Center boxes over the operating nut or stem and set them plumb. The box shall not bear on the valve or pipe. Set covers flush with pavement or 1/2 inch above landscaped grade unless directed otherwise. Provide a precast concrete valve donut around valve box.

11.11.3 SERVICE BOXES: Service boxes shall be green, UV-resistant polymer service box having a nominal size of not less than 13 inches by 20 inches and a minimum assembled depth of 24 inches. Provide a secure, bolt down green cover permanently marked SEWER. The enclosure may be one piece or may consist of a manufacturer approved box and matching interlocking extension. Field fabricated risers and combinations of components from different manufacturers are prohibited. Provide a minimum of 6” of washed stone beneath the box. Size and arrange the box so every valve, cleanout, adapter, and connection can be operated, inspected, maintained, and replaced without excavation. The box shall not bear upon or transmit surface loads to the piping, check valve, isolation valve, or fittings. Locate service boxes outside vehicular areas unless approved by the Board.

11.11.4 CORROSION RESISTANCE: Wetted or buried trim, fasteners, check-valve components, and exposed hardware shall be Type 316 stainless steel, approved polymer, or another Board-approved corrosion-resistant material. Dissimilar metals shall be isolated where necessary to prevent galvanic corrosion.

11.11.5 TRACER WIRE: Install one continuous No. 12 AWG minimum solid copper tracer wire with green high-molecular-weight polyethylene insulation along every HDPE main, public service branch, and private pressure lateral. Attach wire to the pipe at intervals sufficient to maintain position without damaging the pipe. Bring wire into every service box, valve box, flushing assembly, and air-valve vault using Board-approved terminals.

11.11.6 TRACER-WIRE CONNECTIONS: Make branches and splices only with waterproof connectors specifically listed for direct burial. Soldered, twisted, taped, or wire-nut connections are prohibited. Provide sufficient slack for testing and maintenance. Test continuity and locateability in the Board's presence before paving and final acceptance.

11.11.7 WARNING TAPE AND MARKERS: Install green detectable or nondetectable warning tape, as directed, continuously 12 inches below final grade and above the pipe. Tape shall be at least 6 inches wide and read CAUTION - BURIED SEWER LINE BELOW. Provide permanent utility markers at off-site alignments, crossings, valves, flushing assemblies, and air valves where directed.

11.12 INSTALLATION

11.12.1 GENERAL: Install the system in accordance with approved plans, Board details, these Specifications, the manufacturer's instructions, and applicable permit requirements. Material submittals shall be submitted to the Board prior to the preconstruction meeting. The Board shall be given the opportunity to inspect materials, trench, bedding, pipe, fusion, service connections, stations, appurtenances, testing, and backfill.

11.12.2 HANDLING: Use fabric slings and equipment that will not cut, gouge, kink, or flatten HDPE. Remove pipe with cuts or gouges deeper than 10 percent of wall thickness or other damage that could impair performance. Keep pipe interiors clean and cap open ends whenever work is not in progress.

11.12.3 TRENCH AND BEDDING: Provide a stable trench bottom and uniform support. Bedding for LPS mains, service piping, and station bases shall be per the standard detail.

11.12.4 BACKFILL AND COMPACTION: Place initial backfill carefully to prevent pipe movement and tracer-wire damage. Complete backfill and compaction in accordance with the Board, roadway authority, and approved geotechnical requirements. Restore pavement, yards, drainage, and other surfaces. Correct settlement occurring during the warranty period.

11.12.5 THERMAL AND MOVEMENT: Allow fused pipe to reach a stable trench temperature before final tie-ins and backfill. Place the pipe without tensile stress and provide the manufacturer's recommended allowance for expansion and contraction. Do not force pipe into alignment using valves, station connections, or service fittings.

11.12.6 RESTRAINT: Provide concrete thrust blocking or other approved thrust restraint on public LPS mains at bends, tees, wyes, reducers, valves, terminations, mechanical transitions, connection to rigid structures, and other locations subject to unbalanced thrust, unless otherwise approved by the Board. Design restraint for maximum operating, surge, and test forces and the allowable bearing capacity of the adjacent soil. Place concrete thrust blocks against undisturbed soil and arrange blocking so that valves, mechanical joints, fusion joints, and operating components remain accessible. Independently support valves and other appurtenances so their weight is not carried by the HDPE piping.

11.12.7 WATER-LINE SEPARATION: Unless a more stringent requirement applies, provide at least 10 feet horizontal separation between LPS piping and potable water mains. At crossings, provide at least 18 inches vertical separation with the LPS pipe below the water main. Where these separations cannot be achieved, submit a project-specific protection detail for Board and regulatory approval before construction.

11.12.8 STATION INSTALLATION: Install the tank plumb on a stable, level base. Make inlet, discharge, vent, and electrical penetrations watertight. Install buoyancy protection before groundwater can rise. Do not use the station as a construction sump or permit soil, concrete, aggregate, or stormwater to enter it.

11.12.9 INITIAL MANUFACTURER REVIEW: For the first low pressure sewer project installed by a Developer or Contractor within the Board's system, and when otherwise required, an E/One authorized representative shall review the first two station installations before the remaining stations are installed.

11.13 TESTING AND STARTUP

11.13.1 NOTICE AND WITNESSING: Notify the Board at least two working days before testing. Tests conducted without a Board representative when witnessing is required are invalid and shall be repeated. Furnish all labor, water, temporary connections, pumps, calibrated gauges, data recorders, restraints, and disposal facilities.

11.13.2 SAFETY: Test HDPE piping hydrostatically with water only. Pneumatic testing of LPS mains, pressure laterals, or service connections is prohibited. Remove all entrapped air before pressurization and restrain test ends and temporary connections for the full test force.

11.13.3 HDPE HYDROSTATIC TEST: Test public mains, public service branches, and private pressure laterals in accordance with ASTM F2164 and PPI TN-46 after permanent restraints are complete and the pipe is sufficiently backfilled to prevent movement. Isolate grinder pumps, check valves, controls, air valves, and other components that are not rated or configured for the test.

11.13.4 TEST PRESSURE: Unless the approved test plan establishes another pressure, test at not less than 1.5 times the maximum calculated operating pressure, with a minimum of 100 psi at the highest point and a maximum of 150 psi at the lowest point of the test section for a minimum of 8 hours. The pressure shall not exceed the rating of any component or the allowable test pressure adjusted for pipe temperature.

11.13.5 ACCEPTANCE CRITERIA: Perform initial expansion and test phases for the durations and within the make-up-water limits of ASTM F2164. No visible leakage, weeping, or movement is permitted. There is no leakage allowance for a fused joint. Locate defective work, cut it out, install new materials, and repeat the complete test until accepted.

11.13.6 FLUSHING: After pressure testing and completion of all service branches and appurtenances, flush each main segment with clean water at not less than 2.0 feet per second where practicable. Operate valves and flushing assemblies through their full range. Capture and dispose of flushing water as approved; discharge to storm drains or waters of the State is prohibited unless specifically permitted.

11.13.7 STATION WATERTIGHTNESS: Before startup, test each tank, inlet connection, discharge penetration, and accessway for watertightness in accordance with E/One's instructions. Correct leakage or infiltration. The Board may require a water-hold test before backfill is completed.

11.13.8 FUNCTIONAL TEST: Demonstrate each station using clean water. Verify automatic start and stop, pump flow and discharge pressure, motor current, level sensing, manual run, audible and visual alarms, alarm silence, internal and service-box check valves, isolation valve, and portable-generator connection where provided. Record model and serial numbers and all test readings.

11.13.9 SYSTEM STARTUP: An E/One authorized representative shall attend final startup unless the Board waives attendance. Operate representative upstream, intermediate, and downstream stations; verify main pressure and discharge; confirm valves are in their required operating positions; and submit a signed startup report listing deficiencies and corrective actions.

11.13.10 TRACER-WIRE TEST: Before final acceptance, demonstrate electrical continuity and successful surface location of every main, branch, and lateral. Repair failed sections using approved direct-bury components and repeat the test.

11.14 ACCEPTANCE, RECORDS, TRAINING, AND WARRANTY

11.14.1 CONDITIONS OF ACCEPTANCE: Written acceptance will not be issued until construction and restoration are complete; tests and startup are accepted; punch-list items are corrected; easements and deed notices are recorded; and required records, manuals, warranties, and training are delivered.

11.14.2 RECORD DRAWINGS: Submit signed and sealed record drawings in PDF and editable CAD format. Show surveyed horizontal location and elevation of mains at maximum 200 foot intervals, and locate all branches, stations, service boxes, valves, flushing assemblies, air valves, transition manholes, crossings, casing limits, and deviations from approved plans. Identify nominal pipe size, IPS or DIPS dimensional basis, actual outside diameter, DR and public-private ownership limits for each pipe segment.

11.14.3 ASSET SCHEDULE: Provide an electronic schedule listing each served address and parcel; station coordinates, model, serial number, rim, inlet and discharge elevations; control-panel type; service-box coordinates; nominal pipe size, IPS or DIPS dimensional basis, actual outside diameter, and DR; public-private ownership boundary; startup readings; and warranty start and expiration dates.

11.14.4 FUSION RECORDS: Submit fusion operator qualifications, equipment calibration records, pipe and fitting lot information, butt-fusion data logs, electrofusion records, repair locations, and test reports indexed to the record drawings.

11.14.5 OPERATION AND MAINTENANCE DOCUMENTS: Submit LPS main flushing and valve-exercising procedures; and air-valve maintenance where applicable to the Board. Submit E/One installation, operation, alarm-response, and service manuals; emergency contacts and an approved list of local E/One authorized service providers to each property owner.

11.14.6 TRAINING: Provide separate training for Board personnel on public main appurtenances when requested. Provide training for property owners or the homeowners association on private stations, alarm response, power outages, prohibited discharges, periods of disuse, and obtaining authorized service. Document attendance and delivery of homeowner packets.

11.14.7 WARRANTY: Public improvements remain subject to the general one-year Contractor warranty in these Specifications. In addition, E/One stations, pump cores, controls, and factory components shall carry the manufacturer's current limited warranty, two years from installation or 27 months from shipment, whichever occurs first. Warranties shall be registered and assigned to the applicable property owner. A general warranty shall not shorten a longer manufacturer warranty.

11.15 PROPERTY NOTICE AND OWNER OBLIGATIONS

11.15.1 RECORDED NOTICE: The following notice, or Board-approved equivalent language prepared for the specific development, shall be recorded against each property served by an LPS system and shall run with the land until the Board records or provides a written release:

> *NOTICE OF LOW PRESSURE SEWER SERVICE. This property is served by a privately owned grinder pump station and pressure sewer lateral connected to the Muscle Shoals Utilities Board low pressure sewer system. The property owner is responsible for electrical power and for operation, maintenance, repair, and replacement of the grinder pump station, tank, controls, alarm panel, building sewer, and private pressure lateral to the designated connection point in the service box. After acceptance, MSUB is responsible for the public service connection beginning at that connection point and for the public low pressure sewer main. The owner shall keep electrical power on, promptly respond to alarms, limit water use during a power outage or pump failure, prevent stormwater and prohibited materials from entering the system, maintain access for service, and use E/One-authorized replacement equipment. Failure to maintain the private facilities, correct a discharge violation, or respond to an unsafe condition may result in discontinuance of water or sewer service as permitted by law and Board policy.*

11.15.2 OWNER CARE: The owner shall follow E/One's current care and use instructions and shall prevent prohibited materials from entering the grinder pump station. Inspection, service, or repair of the pump core, controls, or station components shall be performed only by an E/One-authorized service provider. Preventive service shall be performed at the frequency recommended by E/One; no requirement in this Section authorizes an unqualified person to open or repair the pump core. When a building will be unoccupied for an extended period, purge the station as E/One directs and do not disconnect power unless directed by an authorized service provider.

11.15.3 ALARM OR POWER FAILURE: When a high-water alarm occurs or electrical power is unavailable, the owner shall minimize water use and contact an authorized service provider. The owner shall not bypass the alarm, remove the pump, discharge sewage to the ground, or open Board-owned service valves.

11.16 REQUIRED STANDARD DRAWINGS

Low pressure sewer systems shall be constructed using the latest Board-approved standard drawings found on the MSUB website.