GUIDELINES
FOR
SANITARY SEWER PUMP STATION AND
FORCE MAIN DESIGN

FULTON COUNTY

WASTEWATER COLLECTIONS AND RECLAMATION

DIVISION OF

FULTON COUNTY DEPARTMENT OF PUBLIC WORKS

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SECTION 1

PURPOSE AND INTENT

PART 1 PURPOSE AND INTENT

1.1 Adoption of Standards

1.1.1 These Standards and Specifications are adopted by the **Fulton County Public Works (FCPW)** under the authority of the Code of Ordinance of Fulton County and the Constitution of the State of Georgia.

1.1.2 This document will be evaluated from time to time and may be modified with approval by the **Director of the Department of Public Works**, based on future developments of the following:

1.1.2.1 Technological advances

1.1.2.2 Regulatory requirements

1.1.2.3 Advances in Best Practices

1.1.2.4 Department of Public Works' goals

1.2 Guidance

1.2.1 These regulations shall be known as "**Fulton County Guidelines For Sanitary Sewer Pump Station And Force Main Design**" and may be referred to generally as "**Pump Station and Force Main Guidelines**".

1.2.2 This document provides general guidelines for the design, material and construction requirements for sanitary sewer pump stations and force mains to be connected to the Fulton County, Georgia, sanitary sewer collection system where connection to the gravity system is not available.

1.2.3 This document is intended to represent minimum requirements and "best practices" for the following:

1.2.3.1 Sanitary sewer pump stations and force mains connected to the Fulton County sanitary sewer collection system.

1.2.3.2 Pump stations which are, or are intended to be, for the operation and maintenance to be taken over by FCPW.

1.2.4 It is intended that this document and others referenced herein:

1.2.4.1 Will apply to designs for upgrades and expansions of existing Fulton County wastewater pump stations.

1.2.4.2 Will provide guidance to the Department, Design Engineers and Developer in the development and construction of new pump stations and force mains.

1.2.4.3 If there are any discrepancies or ambiguities, FCPW shall be consulted for clarifications and directions.

1.2.5 These Sanitary Sewer Pumping Station and Force Main Guidelines are to be used for pumping station with pumps that are less than 50 HP. Pumping stations and force mains beyond these criteria do not fall within the guidelines of these documents.

PART 2 GENERAL REQUIREMENTS

2.1 Developer shall furnish, install and dedicate to FCPW the entire pump station and force main system.

2.2 It must include an access road with stations that are deeded to FCPW. The design must be reviewed and approved by FCPW.

2.3 Developer's Design Engineer (P.E. registered in the State of Georgia) shall design the system.

2.4 Capacity for Pump Stations:

2.4.1 Pump stations which are constructed by FCPW shall be determined by FCPW.

2.4.2 Pump stations for which the operation and maintenance to be taken over by FCPW shall be as approved by FCPW.

2.4.3 Developer's Design Engineer shall consult with FCPW during the design of the system.

2.4.3.1 The system shall be designed with all components sized to meet the development's flow adjusted for peaks.

2.4.3.2 Developer shall size the system to meet future phases of the project.

A. Developer shall size the system to meet future phases of the project or may upgrade the system at a later date to serve additional phases.

2.4.3.3 FCPW may also decide on the installation of larger capacity pumps, wet wells, force mains, generators, etc. to account for future upstream flows that would eventually drain into the pump station.

2.4.3.4 Any such extra capacity beyond that reserved for the original Developer shall become available for FCPW to utilize at its discretion.

2.4.4 Developer's Design Engineer shall locate the pump station to drain the entire watershed sub-basin. FCPW shall have final approval of the location of the pump station.

2.4.4.1 FCPW will investigate the service impact associated with future Fulton County needs within the sub-basin and the potential installation of additional or larger force mains required to serve the sub-basin that will drain to the pump station.

2.4.4.2 If FCPW decides an additional or larger force main is to be installed concurrently with Developer's project, Developer shall design the additional or larger mains and FCPW must approve the design of said additional or larger mains.

2.4.5 If successful operation of a new pump station is dependent on existing pump station(s):

2.4.5.1 Developer is required to evaluate the existing conditions and design system upgrades to maintain adequate capacities of the existing pump station(s).

2.4.5.2 The design shall be submitted to FCPW for review and approval.

2.4.5.3 During the start-up phase, the Developer must demonstrate successful start-up of the upgrades to the existing pump station(s) prior to start-up of the new pump station.

2.4.5.4 If the Developer has multiple pump stations in series, the start-up sequence shall begin at the point of connection to the existing Fulton County system and proceed upstream to the other pump station(s).

2.5 **Betterment**

2.5.1 **The extra cost associated with increasing the size of the pump station or force main may be paid by the County under a "County Participation Agreement". *The conditions relating to the method of payment will be negotiated by Fulton County on a case-by-case basis during the development review process as allowed per 82-188 of the Fulton County Code of Ordinanaces.***

PART 3 DESIGN CONSIDERATIONS

3.1 Pump Station Types

3.1.1 Site requirements, hydraulics, excavation depths, structure size, operation and maintenance requirements and costs, and aesthetics shall be evaluated when a pump station type is selected.

3.1.2 Submersible Pump Stations

3.1.2.1 The primary type of pump station that is considered in this document is the submersible type, but many of the requirements will apply to dry-pit type pumping stations.

3.1.2.2 ***Submersible pump stations are preferred due to their lower overall maintenance requirements and are typically more compact in size.***

3.1.3 Dry-Pit Pump Stations

3.1.3.1 Dry-Pit Pump Stations are appropriate when the pump size or weight is large enough to make it difficult to move or transport a single pump and motor as determined by Fulton County WWR and Operations.

3.1.3.2 However, should site conditions allow it, a well-tailored submersible station could be used for large submersible pumps.

3.2 Regardless of type or size of pump station, the following items are required elements of all stations:

3.2.1 Wet well, valve and meter vault and other necessary structures.

3.2.2 Pumps, piping, valves, electrical, instrumentation and all associated equipment necessary for reliable operation.

3.2.3 Backup power generator.

3.2.4 Flow metering.

3.2.5 Full station by-pass connection.

3.2.6 Control system with instrumentation and SCADA.

3.2.7 VFDs or soft-starts (both with by-pass starters).

3.2.8 Odor control.

3.2.9 Lighting and utility (water, natural gas, electric, communication, etc).

3.2.10 Protective Coatings.

3.2.11 Addressing site requirements which include aesthetics, access and security including surveillance cameras.

3.3 Where FCPW will be providing O&M services at startup, or at a later date, FCPW shall have final determination as to the type of station constructed including necessary features.

3.4 Unless unavoidable constraints necessitate it, a pump station shall not be installed such that it pumps directly to another pump station.

3.5 Elimination of an Existing Pump Station

3.5.1 Where possible, a gravity line is to be installed to carry flow from an existing pump station to the proposed pump station location for the purpose eliminating the existing pump station.

PART 4 ACCEPTANCE AND WARRANTY

4.1 Developer shall furnish, install, dedicate and provide a two (2) year full warranty from the date of acceptance for operation and maintenance by FCPW, for the entire pump station and force main system to FCPW.

4.2 Two (2) years from the date of transfer of ownership to FCPW, a full preventative maintenance inspection shall be performed by an authorized pump service representative.

4.3 Developer is responsible for the cost of this inspection and any repairs not covered under the warranty.

4.4 All other equipment supplied shall have manufacturer's standard warranties. Warranties shall provide minimum two (2) years of coverage.

4.5 Developer shall be responsible for cost of repairs to any pumps, pipes, valves, meters, fittings and other items.

PART 5 REVIEW AND APPROVAL PROCESS

5.1 General

5.1.1 Fulton County Public Works (FCPW) is responsible for reviewing and approving proposed sanitary sewer pumping station projects in Fulton County.

5.1.2 The review by FCPW is for general conformance to these Guidelines only.

5.1.3 Developer shall have an experienced Professional Engineer registered in the State of Georgia design the pump station facility and associated force main.

5.1.4 Developer and its Design Engineer shall be fully responsible for the planning, design, construction, initial startup and operation of the pump station facility, associated force main and appurtenances.

5.1.5 Developer shall notify FCPW in writing if any variation from these Guidelines is required for their project.

5.1.6 Partial approval and acceptance of the pump station will not be entertained under any circumstance.

5.2 Allowable Use of Pump Station Facilities

5.2.1 Pump stations shall only be approved in Fulton County where the installation of a gravity sanitary sewer system is not practical or feasible.

5.2.2 Practical or feasible shall generally be interpreted to mean that wastewater can be conveyed by gravity flow to an existing sewer.

5.2.3 Generally, the Developer of a residential, commercial, industrial or mixed-use development requiring sanitary collection shall have the responsibility to plan, design, permit and construct the pump station (subject to FCPW approval) and guarantee it for two years after transfer of ownership to DPW.

5.3 Pump Station Conceptual Review and Approval Process

5.3.1 Developer shall submit to FCPW a Conceptual Report.

5.3.2 Before designing a pump station facility, a Capacity Letter must be obtained from FCPW Technical Services.

5.3.3 The main purpose of the Capacity Letter is the following:

5.3.3.1 To make FCPW Wastewater Collection and Reclamation aware of the proposed project.

5.3.3.2 To verify that a pump station is actually necessary or required.

5.3.3.3 To determine if allowance(s) for additional flow to the pump station from off-site source(s) are necessary.

5.3.3.4 To determine level of review necessary to demonstrate available capacity in receiving sanitary sewer.

5.3.3.5 To open the line of communication between Developer and FCPW. Active communication shall be maintained throughout the planning, design, permitting, and construction of the proposed project.

5.3.4 Allow at least thirty days, from the time of submittal, for FCPW to generate the Capacity Letter.

5.3.5 All information to be submitted in the conceptual report shall meet the requirements of these Guidelines.

5.3.6 If FCPW concurs that a wastewater pump station is necessary to serve the proposed development and the conceptual report is approved, the applicant will be authorized to prepare a pump station design for further review. Upon final review and approval, two sets of the submittal will be marked "APPROVED" and returned to Developer.

5.4 Pump Station Design Review and Approval Process

5.4.1 After reviewing these Guidelines, Developer shall prepare a design submittal for FCPW to review the detailed design elements of the proposed pump station.

5.4.2 The submittal must include plans and calculations for the pump station and force main, electrical controls, programmable logic controller (PLC), generators, etc., including the standard details and specifications for the pumps selected.

5.4.3 All information in the design submittal shall meet the requirements of Section 1, Part 6 and the design criteria set forth in Section 3, Part 2 of these Guidelines.

5.4.4 Allow at least thirty days, from the time of submittal, for FCPW to review the design report.

5.4.5 FCPW will return the submittal to the applicant with comments to be addressed.

5.4.6 After all comments have been addressed and approval has been given, two sets of the submittal will be stamped "APPROVED" and returned to Developer.

5.4.7 If FCPW approves the wastewater pump station design, Developer will be authorized to obtain all applicable permits, including a construction permit and electrical permit and may begin construction of the facility.

5.4.8 Once a construction permit is obtained, a preconstruction conference must be held with FCPW and Developer before any work may begin.

5.5 Pump Station Acceptance by FCPW Process

5.5.1 After Developer has completed the pump station construction, they shall contact FCPW in regards to scheduling a start-up inspection.

5.5.2 Developer shall work together with the FCPW representative(s) to successfully complete the inspection and start-up.

5.5.3 In order for FCPW to accept the pump station, Developer must submit the information discussed in Section1, Paragraph 6.3 and 6.4 of these Guidelines.

5.5.4 Acceptance will be scheduled within five (5) business days.

5.5.5 The following requirements shall be completed:

5.5.5.1 Developer shall establish a street address for the pump station. All pump stations must have an address assigned to it prior to acceptance from FCPW.

5.5.5.2 Developer shall acquire all permit approvals from authorities having jurisdiction.

5.5.5.3 Developer shall provide the services of a FCPW approved third party inspector.

5.5.5.4 A visit to the pump station site will be scheduled with the Developer's third party inspector and the FCPW representative(s).

5.5.5.5 A facility inspection will be performed. Any work not meeting FCPW approval at this inspection will be noted and referenced in writing as a punch list.

5.5.5.6 Punch list items from FCPW representative shall be added to the final punch list maintained by the assigned FCPW representative.

5.5.5.7 A work completion date will also be stated on this punch list.

5.5.5.8 Both parties will sign the punch list indicating agreement.

5.5.5.9 Developer, during the facility inspection, shall demonstrate the following as a minimum:

A. All equipment units have been installed according to industry standards and manufacturer's instructions. .

B. That the units operate without overheating or overloading any parts and without objectionable vibration outside of manufacturer's standards and tolerances.

C. That there are no mechanical defects in any of the parts.

D. That the pumps can deliver the specified pressure and flow.

E. That the pumps are capable of pumping raw sewage.

F. That the pump controls operate the station in all required scenarios.

G. That the generator is sufficient to operate the pump station in an event of a power outage and functions according to manufacturer's specifications.

H. That all the instrumentation and controls are installed and functioning properly according to the specifications.

I. That the communication between the instrumentation and controls and the central SCADA system is established and functioning properly according to the specifications.

J. That all cables, conduits and wiring raceways meet the specifications.

K. That all the necessary documentation for the instrumentation and controls including but not limited to wiring and cable labels, and controller IO labels are provided and are according to the specifications.

L. All alarms (high level, power outage) are operable and working.

5.5.5.10 Developer shall deed title to land on which the pump station and all appurtenances (including the access road) are installed to FCPW.

5.5.5.11 Developer shall also deed ownership of the pump station facility and all appurtenances to FCPW.

5.5.5.12 Proof of transfer of title shall be required before start-up of the pump station will be initiated.

5.5.5.13 When all points of the punch list have been completed by Developer to the satisfaction of the FCPW representative, FCPW will make formal acceptance of the pump station.

5.5.5.14 After utilities have been connected, the start-up of the pump station shall be conducted by Developer and a representative of the pump manufacturer, and shall be witnessed by the FCPW representative.

5.5.5.15 If the proposed pump station facility is NOT accepted by FCPW Developer will not be able to obtain a Certificate of Occupancy for the proposed development.

5.5.5.16 Developer shall guarantee the entire pump station facility for a period of **two (2) years** from the date of acceptance (as established by FCPW) and shall promptly remedy, repair or correct any defect or omission in the work during this **two-year** period.

A. Developer shall provide FCPW with a maintenance bond or line of credit valued at 10% of construction cost.

5.5.5.17 Developer shall have utilities (water, electricity, telephone and gas, if applicable) installed in its name and shall pay these utility bills for the period of ownership prior to acceptance by FCPW.

5.5.5.18 After the **two-year warranty** and maintenance period, inspection of the facility will be conducted by Developer and the FCPW Representative. The maintenance bond/line-of-credit will be released only upon successful inspection.

5.5.5.19 If there are no outstanding problems, such as leaks, malfunctioning equipment, or deferred maintenance, the utility billing will be transferred to FCPW. Developer will supply FCPW with the account numbers for each utility.

5.6 Recommendations for Ordering Equipment and Utility Sources

5.6.1 Since manufactures' delivery times for pump stations, control panels, telemetry and peripheral accessories may vary widely, it is recommended that orders for this equipment be placed when pump station design approvals are received from FCPW.

5.6.2 This will help to avoid delays at the time of final plat submittal for the proposed development.

5.6.3 It is also recommended that application for utility (water, electricity, telephone and gas, if applicable) service to the pump station be made as early as possible.

5.6.4 Experience has shown that connection of utility service is often a major reason for delays in pump station completion.

PART 6 SUBMITTAL REQUIREMENTS

6.1 General

6.1.1 All submittals shall be made to:

Fulton County Public Works Technical Services

141 Pryor St SW

Suite 6001

Atlanta, GA 30303

6.1.2 A "Sanitary Sewer Pumping Station and Force Main Checklist" is provided in Appendix A. This checklist is used by FCPW during design review/approval and is provided for information only.

6.2 Pump Station Conceptual Review and Approval Submittal

6.2.1

6.2.2 The conceptual review and approval submittal shall be presented in report format with maps and development plans to an appropriate scale.

6.2.3 The following items shall be included in the report:

6.2.3.1 Completed Conceptual Review and Approval Form (see Appendix A).

6.2.3.2 Proposed site located on a USGS Quadrangle map, with the proposed pump station location shown.

6.2.3.3 The map shall show the limits of the proposed development and of the sub-basin that drains to the pump station.

6.2.3.4 Location of proposed connection to receiving sanitary sewer.

6.2.3.5 Calculations for wastewater flows generated by the proposed development.

6.2.3.6 Calculations for wastewater flows generated in the remainder of the sub-basin.

6.3 Pumping Station Design Review and Approval Submittal

6.3.1 The design review and approval submittal shall be presented in plan format with maps and development plans to an appropriate scale.

6.3.1.1 Four (4) sets of 11"x17" design plans and one (1) electronic copy (in AutoCAD and PDF formats) of design plans shall be submitted.

6.3.1.2 The AutoCAD files shall follow the format and requirements presented in Appendix A – Fulton County As-Built CAD Standards of Section 01 78 38 – Record Documents of the "Fulton County Wastewater System Standard Specifications."

6.3.2 The plan set shall include:

6.3.2.1 A legend depicting the following:

A. Symbols used in the drawings.

B. General notes pertinent to FCPW requirements.

C. FCPW standard details used within the plan set.

6.3.2.2 A text box that denotes the following:

A. The flow rate from the selected pump in gpm.

B. The size and cross sectional area of the discharge piping in the wet well in inches.

C. The resulting velocity within the discharge piping in fps shall be included on the pump station detail sheet.

6.3.2.3 A fitting schedule that contains the following:

A. Pipe size and material.

B. Fitting sizes.

C. Valve sizes and type.

D. Other appurtenances (e.g. Flow meter, pressure gauge, etc.)

E. Shall be listed on the pumping station detail sheet.

F. Pump station standard details are provided in Appendix B.

6.3.2.4 The following items shall be included in the design submittal and shall be stamped by a Professional Engineer registered in the State of Georgia:

A. Completed Design Review and Approval Form (see Appendix A).

B. Location map depicting property and land lot lines, buildings and roads.

C. Pump curve and system head curve (showing both new force main and maximum system head at worst pipe conditions.)

D. Pump details, specifications and shop drawings including wet well elevations.

E. Valve details, specifications and shop drawings.

F. Flow meter details, specifications and shop drawings.

G. Generator details, specifications and shop drawings, along with automatic transfer switch specifications and shop drawings.

H. Telemetry equipment details, specifications and shop drawings.

I. Single line electrical drawing showing power distribution for the proposed pump station.

J. Force main design showing size, material, plans, profiles and valve locations.

K. Depiction of receiving gravity sanitary sewer system and connection to proposed pump station force main.

L. Completed Pump Station Design Calculations Form (see Appendix A)**.**

M. Conduit and raceway specifications. See Electrical Conduit Specifications in Appendix A.

6.4 Pump Station Acceptance by FCPW Submittal

6.4.1 The pump station start-up check list is provided in Appendix A.

6.4.2 At the start-up inspection, Developer shall provide the following materials to FCPW:

6.4.2.1 As-built drawings and all previously submitted information of the pump station facility.

6.4.2.2 Manufacturer's warranties.

6.4.2.3 A certified pump test curve from the manufacturer must be provided on all pumps prior to acceptance.

6.4.2.4 Proof of transfer of title of deed and transfer of ownership to land on which the pump station and all appurtenances are installed, including the access road, and which are dedicated to FCPW.

6.4.2.5 Developer shall also deed ownership of the pump station facility itself and all appurtenances to FCPW.

6.4.3 An example Pump Station Design Review and Approval Form is provided in Appendix A.

6.4.3.1 Items 6.4.2.1 and 6.4.2.2 must be provided in paper copy and electronic format.

6.4.3.2 All electronic files shall be in Adobe® (*.pdf) and AutoCad format. The electronic data shall be presented in the following file structure:

PUMP STATION SUBMITTAL FILE STRUCTURE

Folder	Information
Data Sheet	Completed Project Data Forms
Engineering Design	Engineering Design Reports
As-built Drawings	As-built drawings of pump station, .pdf format
As-built Drawings	As-built drawings of pump station, .dwg format
Pump Submittal	All manufacturer's submittals, reports, and tests of pumps
Shop Drawings	All other equipment shop drawings
O&M Manuals	Operation and Maintenance manuals for all equipment
Warranty Forms	Copies of all warranties
Deeds and Easements	Copies of all deeds and easements

6.5 Force Main Information to be shown:

6.5.1 Information within this section shall be provided for force main designs or pumping station projects that include a force main design component that extends beyond the pump station pad.

6.5.2 A title block presented on each sheet shall include the following:

6.5.2.1 The name of the development

6.5.2.2 Phase or unit of development (if applicable)

6.5.2.3 Land lot and district

6.5.2.4 Name, address and phone number of Developer and Developer's Design Engineer

6.5.2.5 Professional seal of Developer's Design Engineer with signature.

6.5.3 A cover sheet shall be included with a drawing index.

6.5.3.1 The cover sheet shall include an approval block for FCPW signature.

6.5.3.2 Cover sheet shall include a location map with north arrow.

6.5.4 Plan View

6.5.4.1 Plan view shall have a scale of not more than fifty (50) feet to the inch [1” = 50’].

6.5.4.2 Show all location, size and material of construction for all proposed pipelines within the project area.

6.5.4.3 The proposed force mains shall be shown on the plans as solid lines with size, material, use and pipe class called out.

A. For example: “8-inch DIP (FM)-Epoxy Lined, Class 350”.

6.5.4.4 Plans shall show the location of all force mains and gravity sanitary sewers.

6.5.4.5 Plans shall also show any pump stations adjoining the force main system.

6.5.4.6 All proposed and existing easements shall be shown.

6.5.4.7 Plans shall show all other buried existing or proposed utilities, including storm and gravity sanitary sewers, drywells, potable water mains, buried telephone, natural gas, power and cable TV lines, within the project area that are concurrent with proposed force main construction.

6.5.4.8 Existing utilities should be shown to the extent known, given records available to Developer’s Design Engineer.

6.5.4.9 Existing utilities shall be shown as dashed lines.

6.5.4.10 Construction details should note that all buried utilities are to be field located prior to construction.

6.5.4.11 Plans shall show the tie-in point(s) of the proposed force main system to the FCPW existing system.

6.5.4.12 Plans shall include typical construction details of the following:

A. All tie-ins to existing pipelines and structures.

B. Typical trench cross-sections including bedding, backfill, and compaction requirements.

C. Manholes.

D. Service connection details.

6.5.4.13 The project benchmarks shall also be shown and referenced to state plane coordinates.

6.5.5 Profile View

6.5.5.1 Profiles shall show each force main, manhole, sanitary sewer line, lift station, utility crossings etc. as referenced on the plan view.

6.5.5.2 Profiles shall list pipe utility use and material, size of pipe and bedding materials.

6.5.5.3 Profiles shall have a vertical scale of not more than ten (10) feet to the inch.

PART 7 CHANGE OR VARIANCE PROCEDURES

7.1 General

7.1.1 Approved plans shall not be modified, nor deviated from, unless approved in writing by FCPW.

7.1.2 Any changes to the design documents after approval has been granted by FCPW shall require the resubmittal of the design documents incorporating and highlighting the requested changes for review and approval.

7.1.3 Any deviations from the approved plans during construction must have approval from FCPW prior to the deviation being made.

7.1.3.1 A "Request For Exception/Change To Pump Station Construction**"** form as found in these Guidelines must be completed and submitted to FCPW for approval. The FCPW Inspector will make sure that all appropriate approvals are received.

7.2 Justification for Changes or Variances

7.2.1 Variances

7.2.1.1 Requests for variances to these Guidelines shall be brought to the attention of FCPW during the initial meeting with the same. If FCPW indicates Fulton County will consider the variance, Developer shall provide the necessary justification for the variance to be considered.

7.2.1.2 The justification shall include:

A. Identification of the proposed variance.

B. Identification of the requirements of those Guidelines for which a variance is being requested. Identification shall include the section and paragraph number of the Guidelines being referenced.

C. Reason(s) for the proposed variance request.

D. Description of the benefits or impacts to Fulton County's wastewater infrastructure if the variance is allowed.

E. Impact on the overall pump station and force main system.

7.2.2 Changes

7.2.2.1 Developer shall provide a detailed description of the reason(s) for the changes to the approved plans. If FCPW indicates Fulton County will consider the change, Developer shall provide the necessary justification for the change to be considered. The description shall include the following:

A. Identification of the proposed change.

B. Reason(s) for the proposed change.

C. Impact on the overall pump station and force main system.

7.3 Submittal Requirements

7.3.1 Variances

7.3.1.1 In order for FCPW to make a determination on whether a variance should be allowed, the following information shall be submitted to FCPW for review:

A. Justification information identified above.

B. Equipment or material data sheets for the proposed variance item, if applicable.

C. Design calculation and preliminary drawings for the proposed variance item, if applicable.

D. References to industry standards supporting the proposed variance, if applicable.

E. Variances for the sole purpose of economic benefit for Developer <u>**WILL NOT**</u> be considered.

7.3.2 Changes

7.3.2.1 In order for FCPW to decide if a change to the approved plans will be allowed, the following information shall be submitted to FCPW for review.

A. Revised plans showing the proposed change(s) highlighted for ease of comparison with the original approved plans.

B. Revised design calculations for the pumping system and force main in compliance with the original submittal requirements, if applicable.

C. Shop drawings and submittal data for the proposed change(s) as defined under the original submittal requirements, if applicable.

D. Any other information which will show the proposed change provides a system at least equal to, if not better than, the original approved plans.

7.4 Review and Approval Process

7.4.1 The review and approval processes for the variance or change requests will follow the same procedures as the initial approval processes described herein above. If the proposed change(s) does not impact issued permits, the submittals and reviews through FCPW are not required. It is Developer's responsibility to determine if revisions to permits will be required.

7.4.2 If the proposed changes require revisions to approved permits, it is Developer's responsibility to make the necessary submittals for revising the permits and obtain the required permits for construction.

7.4.3 If the proposed variance is approved, FCPW will issue a letter indicating the approval of the variance, to Developer.

7.4.4 If a proposed change is approved, FCPW will request the required number of plans be provided and will stamp the revised plans approved and distribute copies as described herein above. These plans shall be used for construction with a copy on site at all times.

7.4.5 If the variance or change is not approved, Developer shall follow the requirements of these Guidelines and/or the previously approved plans.

SECTION 2
DEFINITIONS & REFERENCES

PART 1 DEFINITIONS

Definitions and terms and requirements listed here shall apply throughout this document whether referenced elsewhere or not.

Acceptance

The time after which the pump station and force main have been tested and approved by FCDWP to operate and discharge to the Fulton County Sanitary Sewer System.

Chapter 82, Utilities

Part of the Code of Ordinances of Fulton County which define Sewers and Sewage Disposal and Sewer Use and Pretreatment in Fulton County.

Commercial Wastewater

Typically, this includes wastewater discharges from treatment systems such as grease traps for restaurants, schools, churches, hotels, etc., and oil separators for car maintenance and car/truck washes. Refer to the Fulton County Sewer Use Ordinance.

Contractor or Constructor

Any individual, firm, or corporation with whom a contract is made by the developer or the FCDWP for the purpose of constructing the sanitary sewerage systems described herein.

Developer

Any individual, firm, or corporation who contracts with a contractor to construct a sanitary sewerage system which serves a specific privately developed area such as a residential subdivision or commercial area.

Developer Engineer

The experienced engineer who is hired by the Developer and is in responsible charge of the design of the developer-installed sanitary sewerage system and pump station. The engineer's experience here shall mean having successfully designed municipal wastewater pump stations and force mains, and those designs shall have been constructed and successfully commissioned. Developer's Engineer shall be a Professional Engineer appropriately licensed by the Georgia State Board of Registration for Professional Engineers and Land Surveyors.

DIP

Ductile Iron Pipe

Discharge Manhole

A manhole on a sanitary sewer gravity pipeline where force main discharges pumped flow from a wastewater pump station.

Domestic Wastewater

Wastewater from sanitary fixtures such as toilets, and residential appliances.

Industrial Wastewater

Wastewater discharges from facilities such that the pollutants or volume of discharge require periodic monitoring. Refer to the Fulton County Sewer Use Ordinance.

Engineer

An Engineer or Firm who is hired by the FCDWP and is responsible for the sanitary sewerage system design; may also be referred to as consulting Engineer or consultant.

FCPW

Fulton County Public Works may be used interchangeably herein with FCDWR.

FCDWR

Fulton County Department of Water Resources, may be used interchangeably herein with FCPW.

Firm Pumping Capacity

Capacity of the pumping station with one pump of each size out of service or on standby.

Force Main

A pipeline carrying pressurized wastewater flow pumped from a wastewater pump station.

FPS

feet per second

GIS

Geographic Information System

GPD

Gallons per day

GPM

Gallons per minute

HDPE

High Density Polyethylene

HP

Horse Power

Industry Standards

Unless this or other design documents include more stringent requirements, applicable design or construction industry standards shall assume to have the same applicability as if directly referenced here.

MGD

Million gallons per day

NFPA 70

National Electric Code

NFPA 70E

Standard for Electrical Safety in the Workplace

NFPA 820

Standard for Fire Protection in Wastewater Treatment and Collection Facilities

PCF

Pounds per cubic foot

PLC

Programmable Logic Controller

PSI

Pounds per square inch

Pump Station

A structure, either above and/or below ground, which houses pumps, piping, valves, electrical, controls, and auxiliary equipment. The primary purpose of a pumping station is to increase the energy of the wastewater using either kinetic or displacement pumping equipment to raise the fluid pressure, elevation, and/or quickly move the fluid over long distances. A pump station may also be referred to as a lift station. For the purposes of FCDWP and this document, pump stations are further sub-divided as follows:

Submersible Pump Station

One in which the wastewater pumps are submerged in the wastewater, with controls, power, and other elements located at or above ground level.

Dry Pit Pump Station

One in which the wastewater pumps are housed in a dedicated pump room but separated from the wastewater, with controls, power, and other elements installed within the same structure and protected from the weather and wastewater. This allows access the installed pumps for maintenance or other reasons.

PVC

Polyvinyl chloride

Reserved Capacity

To be defined

Sanitary Sewerage System

As defined in Article III, chapter 82 of the Code of Ordinances of Fulton County. Means a combination of methods for collecting and transporting untreated wastewater, from its source of generation to a sewage treatment plant. This includes street sewers (which collect sewage from building sewers or sewer service laterals), outfalls which collect sewage from the street sewers and interceptors or main collector sewers which collect sewage from outfalls and lead directly to the treatment plant.

SCADA

Supervisory Control and Data Acquisition System

Sewer Use Ordinance

Article IV, chapter 82 of the Code of Ordinances of Fulton County. To prevent the introduction of pollutants into the publicly owned treatment works that will interfere with its operation; to prevent the introduction of pollutants into the publicly owned treatment works that will pass through the publicly owned treatment works, inadequately treated, into receiving waters, or otherwise be incompatible with the publicly owned treatment works.

Solids-Bearing Liquids

Shall mean liquids to be pumped containing, or are assumed or likely to contain, solids that require appropriate pump design considerations and/or materials of construction. Solids-bearing liquids could contain rags, stringy materials, trash, non-deformable solids, grease, or grit. Solids-bearing liquids may also be liquids with settleable solids exceeding 50 milligrams per liter (mg/L) and include wastewater, stormwater, primary effluent, return sludge, return activated sludge

(RAS), trickling filter circulation, and similar services or may be a combination of the preceding.

Standard Details and Specifications

Refers to the standard sanitary sewer details and specifications used by the FCDWP showing and describing materials, products, and installation requirements for piping and appurtenances used in FCDWP's sanitary sewer system. The most current version of these documents are incorporated into this document by reference. May also be referred to as "Standards", "Standard Details" or "Standard Plans".

Wastewater

Water-born wastes including those from households, businesses, and industry. The Fulton County Sewer collection system is a separate sanitary system designed to prevent stormwater from entering the sanitary sewerage system. Refer to the Fulton County Sewer Use Ordinance. As applicable to pumping stations and equipment, wastewater shall be considered to be Solids-Bearing Liquids.

PART 2 ABBREVIATIONS, ACRONYMS, AND REFERENCES

Where abbreviations and acronyms are used in specifications or other documents, they shall mean the recognized name of the entities in the following list, unless specifically described otherwise.

AA Aluminum Association, Inc. (The)
www.aluminum.org

AASHTO American Association of State Highway and Transportation Officials
www.transportation .org

ACI ACI International (American Concrete Institute)
www.aci-int.org

ACPA American Concrete Pipe Association
www.concrete-pipe.org

ADAAG Americans with Disabilities Act (ADA), Architectural Barriers Act (ABA), Accessibility Guidelines for Buildings and Facilities
www.access-board.gov

AGA American Gas Association
www.aga.org

AI Asphalt Institute
www.asphaltinstitute.org

AISC American Institute of Steel Construction
www.aisc.org

AISI American Iron and Steel Institute
www.steel.org

ANSI American National Standards Institute
www.ansi.org

AOSA Association of Official Seed Analysts
www.aosaseed.com

APA Architectural Precast Association
www.archprecast.org

ASCE American Society of Civil Engineers
www.asce.org

ASHRAE American Society of Heating, Refrigerating and Air-Conditioning Engineers
www.ashrae.org

ASME ASME International (The American Society of Mechanical Engineers International)
www.asme.org

ASSE American Society of Sanitary Engineering
www.asse-plumbing.org

ASTM ASTM International (American Society for Testing and Materials International)
www.astm.org

AWS American Welding Society
www.aws.org

AWWA American Water Works Association
www.awwa.org

CDA Copper Development Association Inc.
www.copper.org

CE Army Corps of Engineers
www.usace.army.mil

CGA	Compressed Gas Association www.cganet.com
CFR	Code of Federal Regulations www.gpoaccess.gov/cfr/index.html
CLFMI	Chain Link Fence Manufacturers Institute www.chainlinkinfo.org
CPPA	Corrugated Polyethylene Pipe Association www.cppa-info.org
CRSI	Concrete Reinforcing Steel Institute www.crsi.org
CSI	Construction Specifications Institute (The) www.csinet.org
DIPRA	Ductile Iron Pipe Research Association
EPA	Environmental Protection Agency www.epa.gov
EJCDC	Engineers Joint Contract Documents Committee www.asce.org
EJMA	Expansion Joint Manufacturers Association, Inc. www.ejma.org
FAA	Federal Aviation Administration www.faa.gov
FCI	Fluid Controls Institute www.fluidcontrolsinstitute.org
FMG	FM Global (Formerly: FM - Factory Mutual System) www.fmglobal.com
FSA	Fluid Sealing Association www.fluidsealing.com
Georgia DNR	Georgia Department of Natural Resources www.gadnr.org
GSI	Geosynthetic Institute (Geosynthetic Research Institute, GRI) www.geosynthetic-institute.org

HI ***Hydraulic Institute***
www.pumps.org

HI Hydronics Institute
www.gamanet.org

HUD Department of Housing and Urban Development
www.hud.gov

IEEE Institute of Electrical and Electronics Engineers, Inc. (The)
www.ieee.org

IAPMO International Association of Plumbing and Mechanical Officials
www.iapmo.org

ICBO International Conference of Building Officials (See ICC)

ICBO ES ICBO Evaluation Service, Inc. (See ICC-ES)

ICC International Code Council (Formerly: CABO - Council of American Building Officials)
www.iccsafe.org

ICC-ES ICC Evaluation Service, Inc.
www.icc-es.org

ISO International Organization for Standardization
www.iso.ch

LPI Lightning Protection Institute
www.lightning.org

MBMA Metal Building Manufacturers Association
www.mbma.com

MSS Manufacturers Standardization Society of The Valve and Fittings Industry Inc.
www.mss-hq.com

NACE NACE International (National Association of Corrosion Engineers International)
www.nace.org

NCMA National Concrete Masonry Association
www.ncma.org

NCPI National Clay Pipe Institute
www.ncpi.org

NEMA National Electrical Manufacturers Association
www.nema.org

NFPA NFPA
www.nfpa.org

NOAA National Oceanic and Atmospheric Administration
www.noaa.gov

NRMCA National Ready Mixed Concrete Association
www.nrmca.org

NSF NSF International (National Sanitation Foundation International)
www.nsf.org

NSSGA National Stone, Sand & Gravel Association
www.nssga.org

OSHA Occupational Safety & Health Administration
www.osha.gov

PCI Precast/Prestressed Concrete Institute
www.pci.org

RUS Rural Utilities Service (See USDA)

SAE SAE International
www.sae.org

SBCCI Southern Building Code Congress International, Inc. (See ICC)

SPI/SPFD Society of the Plastics Industry, Inc. (The)
Spray Polyurethane Foam Division (See SPFA)

SSPC SSPC: The Society for Protective Coatings
www.sspc.org

STI Steel Tank Institute
www.steeltank.com

SWRI Sealant, Waterproofing, & Restoration Institute
www.swrionline.org

TMS The Masonry Society
www.masonrysociety.org

UL Underwriters Laboratories Inc.
www.ul.com

UNI Uni-Bell PVC Pipe Association
www.uni-bell.org

USDA United States Department of Agriculture
www.usda.gov

USPS United States Postal Service
www.usps.com

SECTION 3

GENERAL TECHNICAL REQUIREMENTS

PART 1 GENERAL

1.1 The pump station shall be designed and constructed in accordance with the requirements and Standard Details referenced and provided herein.

1.2 Several drawings are included with this document which provide examples of expected configurations and features of the pump stations.

1.3 Flood Protection

1.3.1 The pump station tops of structures shall be designed to be protected from the **100-year flood.**

1.3.2 **All electrical and control components including generator shall be installed above the 500 year flood level.**

PART 2 DESIGN CRITERIA

2.1 Pump Station Service Area Map

2.1.1 The potential service area of the pump station shall be clearly delineated on an area map.

2.1.2 The service area shall include the area that can reasonably flow by gravity to the pump station site based upon topography.

2.1.3 The service area map must also identify any areas being served by existing sewer facilities.

2.1.4 If the sanitary sewer drainage basin is larger than the proposed pump station service area, FCPW reserves the right to require larger pumps, wet well, storage facilities and force main.

2.1.4.1 These will be considered on a case by case basis.

2.2 Design within GDOT ROW

2.2.1 If any portion of a proposed project enters a State of Georgia controlled right-of-way, then a GDOT permit application is required.

2.2.2 Developer shall submit to FCPW the required materials in hard copy and in electronic form, on a flash drive.

2.2.3 Hard copy forms, permits and drawings, etc. shall be on 8 ½” X 11" papers. Drawings may be on 11” X 17” papers and need not be to scale.

2.2.3.1 All measurements necessary for the permit application must be submitted in English.

2.2.3.2 Generally, portions of the project design can be reduced in size and matchlined, if necessary, as long as the text remains legible.

2.2.3.3 Compaction notes indicating compaction requirements must be included on every construction drawing required for the application (see Section 6, Paragraph 1.11 for backfill requirements).

2.2.3.4 Submittal shall include four (4) each of the following:

A. Plan

B. Profile

C. Traffic control plan

D. Section from GDOT county map.

E. The GDOT Permitting Checklist is provided in Appendix A.

2.2.4 GDOT requires the GDOT permit application to be submitted through the Georgia Utilities Permitting System (GUPS).

2.2.4.1 Developer will not be able to submit the GDOT permit directly through the GUPS.

2.2.4.2 Developer shall provide all necessary information, as stated in the previous paragraphs. FCPW will review the information and provide comments (if necessary).

2.2.4.3 Once the necessary information has been approved, FCPW will submit the GDOT permit application through the GUPS.

2.2.5 Developer shall refer to the GDOT Utility Accommodation Policy and Standards Manual, most current edition, for policies regarding construction of utilities within the public highway right-of-way.

2.2.6 Traffic control shall be in accordance with the Manual on Uniform Traffic Control Devices (MUTCD), latest edition.

2.2.7 Trench restoration within GDOT right-of-way shall be in accordance with GDOT Standard Detail 1401 Pavement Patching Details.

2.2.8 All bore and jack pits must be a minimum of ten (10) feet from outside edge of pavement.

2.2.8.1 Plans shall show casing size and carrier pipe size within the approach slab for bridge crossings.

2.2.9 All documents necessary for said application must be provided by Developer's Engineer.

2.3 Calculation of Sanitary Flows

2.3.1 All flow calculations shall be presented in the Pump Station Design Calculations Form, Appendix A.

2.3.2 Follow the submittal process described in Section 1, Part 6 of these Guidelines.

2.3.3 Determination of design sanitary flows shall be based on wastewater flows expected to become tributary to the pump station for the entire development at build-out.

2.3.3.1 The sanitary flows will be identified as on-site sanitary flows and off-site sanitary flows.

A. On-site sanitary flows are those flows that will be generated directly from the project site.

B. All other flows shall be identified as off-site sanitary flows and shall be based on wastewater flows expected to become tributary from the entire drainage basin over the life of the pump station.

2.3.3.2 In addition, sanitary flows that will be realized immediately shall be identified as "initial flows" and the remaining flows shall be identified as "future flows."

2.3.3.3 Delineation of Drainage Basin

A. The drainage basin surrounding the proposed site shall be delineated with the location of the pump station as the most downstream point.

B. If the entire drainage basin is within the proposed site, the Average Daily Flow (ADF) is calculated by applying the flow generation factors from the table below.

C. If there are additional offsite areas within the drainage basin that are upstream of the proposed development, those areas need to be accounted for when calculating the ADF.

D. FCPW will determine during the conceptual review and approval process whether a proposed pump station will need to service off-site flows.

2.3.4 Average Daily Flow

2.3.4.1 The Average Daily Flow (ADF) that a site will generate is calculated based on the use of the site.

2.3.4.2 The table below shows sanitary flow generation factors, in gallons per day (gpd), which can be used to estimate sanitary flows from proposed and existing developments.

SANITARY FLOW CONTRIBUTIONS FROM SITE SPECIFIC SOURCES

Contributor	Sanitary Flow (gpd)
Airports, Railroads, Bus Terminals	5/Passenger + 10/Employee
Stadiums, Racetracks, Assembly Halls	5/Seat
Bar/Lounge	30/Seat
Barber Shop/Beauty Salon	125/Chair + 20/Employee
Bath House for Swimming Pool	10/Swimmer
Boarding Houses	75/Resident
Bowling Alley	75/Lane + 20/Employee
Car Wash (non recycling)	75/Car
Church	5/Sanctuary Seat
Campgrounds without Sewer Connections	100/Space
Campgrounds with Sewer Connections	150/Space
Country Club	25/Member
Day Camp	20/Person
Day Care Center	15/Person
Dental Office	20/Employee + 100/Chair
Fitness Center/Spa	50/Person
†Food Service **	†Food Service **
Food Service – Restaurants Open 24 Hours/day	75/Seat + 20/Employee
Food Service – Restaurants Open Less than 24 hour/day	50/Seat + 20/Employee
Restaurants on Interstates	100/Seat+20/Employee
Drive-In Restaurant	50/Space+20/Employee
Food Service – Catering	50/100-ft^2 Floor Space

Contributor	Sanitary Flow (gpd)
Carryout Only, Food Stands	50/100-ft² floor space +20/Employee
Catering (single service only)	50/100-ft² floor space
Funeral Home	300/Embalming + 100/Employee
†Grocery Store	200/1000-ft2 Floor Space
Hospital	300/Bed + 100/Resident Staff
Hotel/Motel	100/Room
Motel with Kitchenette	150/Room
Laundry, Sel-service	500/Machine
Marina (pump out facilities)	30/Slip
†Meat Market	50/100-ft² Floor Space
Medical Offices	200/Exam Room
Nursing Home/ Nursing Home/Personal Care Home, etc.	150/Bed + 100/Resident Staff
Prison/Jail	125/Bed + 20/Employee
Resident Camps	60/Person
Homes (Residences)	150/Bedroom
Rest Area	Determined after consultation with GA DOT
Retail Stores Retail Stores, Convenience Stores (Freestanding)	Larger of 400/Restroom or 100/Fixture
Schools – Day, Toilets Only	12/Person
†Schools – Day, Toilets, Cafeteria	16/Person
†Schools – Day, Toilets, Cafeteria, Gym	20/Person
†Schools – Boarding	100/Person
Service Station	20/Person
Interstate Location	3000 Minimum
24 Hour Operation	325/fixture
<24 Hour Operation	250/fixture

Contributor	Sanitary Flow (gpd)
Shopping Center/Mall	100/1000-ft^2 Enclosure Space
Theaters (Indoor)	5/Seat
Theaters (Drive-in)	10/Space
Veterinary Office/Animal Hospital	100/Run + 10/Cage + 20/Employee
Workers Including Factory, Office, School, Commercial and Construction (Without Showers and Industrial Waste)	30/Person
† Operations with BOD_5 and TSS greater than 200 mg/L require pretreatment to reduce BOD_5 and TSS to 200 mg/L or below.	
** These flows are to be additive to other flows. For example, a bar or lounge serving food would have this flow added to the 30 gpd per seat flow.	

Note: Flow Estimating Factors based upon Georgia Environmental Protection Division Large Community Design Guidance, Appendix A (Latest Edition)

2.3.5 Offsite Areas

2.3.5.1 If it is determined by FCPW that offsite flows need to be accounted for in the design of the pump station, the following process shall be followed.

A. If the offsite area is already developed, an analysis of the existing sites using the flow contributions in the above table will result in additional ADF that must be accounted for.

B. If the offsite area is not developed, the future land use must be analyzed to determine the development potential of the area.

C. Developer shall work with FCPW Technical Services to determine land use and flow projections for average and peak daily flows.

D. If the sum of the ADF generated onsite and the offsite area's calculated flow results in pump selection outside the limits of these pumping station and force main Guidelines, coordinate design efforts with FCPW staff.

2.3.6 Peaking Factor

2.3.6.1 Once the total ADF has been determined, the flow must be multiplied by a Peaking Factor (PF) to determine the peak flow that will be realized in the pump station.

2.3.6.2 The peaking factor shall not be less than 2.5.

2.4 Determination of Receiving Sewer Capacity

2.4.1 Before a pump station can be considered, it must be determined that the receiving sanitary sewer is not already capacity limited. If the receiving sewer is already capacity limited, this can cause surcharging and create the potential for wastewater overflows.

2.4.2 During the pump station conceptual review and approval process, FCPW will determine the level of analysis that must be performed to determine if a proposed pump station will cause capacity problems.

2.5 Calculation of System Head Curve

2.5.1 The total dynamic head (TDH) is the head against which the pump must work.

2.5.2 The TDH is made up of static head and friction headloss.

2.5.3 The TDH is determined by summing the total static head, friction losses and velocity head losses.

2.5.3.1 Friction losses include those from pipe, fittings and valves.

2.5.4 When TDH is plotted against discharge, the resulting line is the System Head Curve

2.5.5 Static Head

2.5.5.1 The static head is the distance that the wastewater flows must be moved vertically, from the water surface elevation in the wet well to the highest elevation of the force main or receiving gravity sewer invert.

2.5.5.2 System head curves must be developed for the following static head conditions:

A. Pump-off elevation (greatest static head)

B. Lead pump-on elevation

C. High water elevation (all pumps running at full speed)

2.5.6 Friction Headloss

2.5.6.1 The friction headloss is the head of water that must be supplied by the pump to overcome the frictional losses in the pipe.

2.5.6.2 It is a function of pipe length, diameter, flow rate and the friction coefficient (C factor).

2.5.6.3 The design shall use the Hazen-Williams formula to calculate the pipe Friction Headloss (or the Darcy-Weisbach method, with justification of factors used):

$$h_f = L\left(\frac{10.44Q^{1.852}}{C^{1.852}D^{4.8655}}\right)$$

Where:

h_f is the friction headloss, in feet

L is the force main pipe length, in feet

Q is the flow rate, in gallons per minute

C is the friction coefficient, dimensionless

D is the force main pipe diameter, in inches

2.5.6.4 Because the friction coefficient of the force main will change over time, system head curves shall be generated and evaluated for present and future conditions.

2.5.6.5 The C factors indicated below shall be the only values allowed for these calculations.

2.5.6.6 Friction headloss must be analyzed for the following conditions:

A. The initial operating condition (C =130)

B. The system after it has aged (C =100)

C. C values for material such as HDPE and PVC may be used with FCPW approval.

D. This ensures that when selecting a pump, the operating range will be efficient throughout the lifetime of the pumping system.

E.

2.5.6.7 Friction losses from fittings and valves are calculated using the following formula:

$$h_f = K\left(\frac{V^2}{2g}\right)$$

Where:

h_f is the friction headloss, in feet

V is the velocity in force main, in feet per second

g is the gravitational force (32.17 feet per second^2)

K is the resistance coefficient, dimensionless

2.5.6.8 Refer to Crane, HI, manufacturer's data or Cameron Hydraulic Handbook for published Resistance Coefficients K values.

2.5.7 System Head Curve

2.5.7.1 The System Head Curve represents the conditions under which the pump must operate at various inflows and TDH combinations for a specific set of pipe size, pipe material and pipe length combinations.

2.5.7.2 The System Head Curves can be plotted using the force main discharge (Q) on the x-axis and the corresponding TDH values for each static head and friction headloss condition on the y-axis.

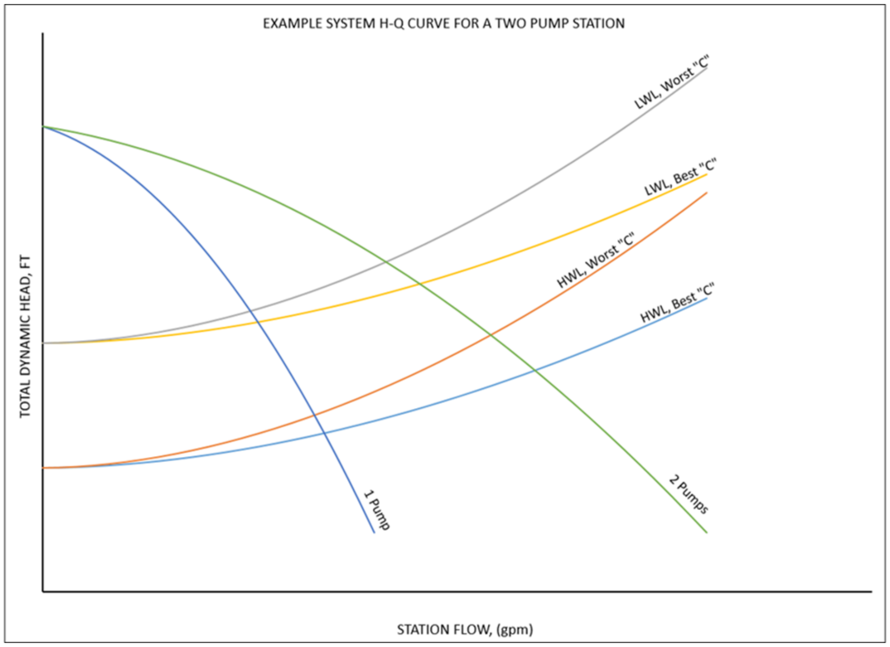
2.5.7.3 These curves define the energy required to pump sanitary flows through the discharge system.

2.5.7.4 When overlaid with pump performance curves provided by the manufacturer, it will yield the pump operating ranges.

2.5.7.5 The pump selected shall be able to operate well under all four pressure conditions.

2.5.7.6 The below figure illustrates example system and pump curves:

Example System and Pump Curves



2.6 Pump Selection Process

2.6.1 Pump selection shall be based on a hydraulic analysis of the system through which the wastewater is to be conveyed.

2.6.2 The design operating range is defined as the intersection of the pump curve and the calculated system curves for the various conditions.

2.6.3 The design operating range of the pumps shall be within ten percent (10%) (on a flow basis) of the Best Operating Point (BOP) of the pump as determined by the manufacturer and identified on the pump curve.

2.6.3.1 Pumps shall be selected such that the pumps are capable of pumping the required capacity for all total dynamic head requirements developed by the system for the lifetime of the pump station.

2.6.3.2 Pumps shall produce a velocity in the discharge piping between three (3) and six (6) feet per second.

2.6.3.3 The pump selected shall be capable of pumping the peak design flow with the largest pump out of service.

2.6.3.4 All pumps shall be non-clogging units (chopper or screw types are preferred) capable of pumping solids bearing liquids and passing six (6) inch spherical objects or provide alternative technologies approved by Georgia Environmental Protection Division (EPD).

2.6.3.5 Pumps shall be selected such that all design operating points are on the pump curve as supplied by the pump manufacturer.

2.6.3.6 In addition, pumps shall be selected such that the net positive suction head available (NPSHA) shall be 130% or greater than the net positive suction head required for the pump (NPSHR) at each of the design operating points.

2.6.3.7 To the greatest extent possible, pumps shall operate at or near their highest efficiency point throughout their anticipated service life, taking into account increases in head requirements (due to increased friction losses) over time.

2.6.3.8 Pumps shall be selected such that the pumps do not cavitate at any point within the design operating range.

2.6.4 Pumps that operate within the unstable portion of the pump curve under any of the expected design conditions shall not be allowed.

2.6.5 Freewheeling (i.e., operating at pump run-out) or deadheading (i.e., operating at pump shut-off) of pumps shall not be allowed.

2.6.6 The impeller chosen shall be the smallest available so that there is flexibility for future increased pumping needs.

2.6.7 The motor horsepower chosen shall be adequate so that the pump is non-overloading throughout the entire pump performance curve from shut-off through run-out.

2.6.8 Material certification specifying the hardness of wearable parts shall be provided by the pump manufacturer.

2.6.9 Pumps shall be constructed in an ISO 9001 approved facility.

PART 3 WET WELLS AND VALVE VAULTS

3.1 General

3.1.1 Circular wet wells shall have a minimum inside diameter of 8 feet.

3.1.2 Rectangular wet wells shall have a minimum interior dimensions of 8 feet x 8 feet square.

3.1.3 Wet well floors, walls, ceilings and piping and exposed metals, which are not inherently corrosion resistant, shall have a corrosion resistant coating or lining system.

3.1.4 No manhole steps or ladders shall be installed in the wet well.

3.1.5 All openings into the wet well shall be covered and sealed airtight to prevent the release of odorous air into the atmosphere.

3.1.6 If the wet well is less than thirty (30) feet deep, the pump station may be a precast polymer concrete wet well with self-cleaning bottom.

3.1.7 If the wet well is greater than thirty (30) feet deep, the pump station may be cast in place designed by a licensed Professional Engineer in the State of Georgia.

3.1.8 Prefabricated structures of fiberglass or other type of materials may be considered on a case by case basis.

3.1.9 Wet well shall be of a self-cleaning design.

3.1.10 The wet well shall be provided with a depth as required to maintain the active storage volume, the emergency storage volume and to allow for proper operation of the duplex pumps.

3.1.11 Wet well and pump intake design shall be designed for solids bearing liquids per ANSI/HI 9.6 and 9.8

3.1.12 Wet well sizing shall be designed in accordance with the requirements of the Section 5 Minimum Hydraulic Requirements.

3.1.13 Wet Well Geometry

3.1.13.1 The following equation shall be used to determine the active storage volume in the wet well (the volume between the pump-on and pump-off elevations) required to generate the required pump cycle time:

$$V = T\left(\frac{Q_{PUMP}}{4}\right)$$

Where

V is the active volume within the wet well, in gallons

T is the allowable pump cycle time between starts, in minutes

Q_{PUMP} is the pumping rate of a single pump, in gpm

3.1.13.2 The geometry of the wet well shall be shaped such that the only flat surfaces occur directly under the pump inlets.

3.1.13.3 The wet well floor shall have a minimum slope of 60 degrees to the hopper bottom.

3.1.13.4 The horizontal area of the hopper bottom shall be no greater than necessary for proper installation and function of the pump inlet.

3.1.13.5 The walls shall be cylindrical, with a eight (8) foot minimum diameter.

3.1.13.6 The entry hatch shall be large enough to remove the pumps for servicing.

3.1.13.7 The wet well shall have a minimum depth of eight (8) feet.

3.1.14 Clearances

3.1.14.1 Pump-to-pump and pump-to-sidewall clearances shall be the minimum possible to minimize the potential for sedimentation problems while also being within the manufacturer’s recommendation.

3.1.14.2 Unless specifically prevented by site conditions, the top of the wet well shall be at least two feet below the lowest building floor elevation receiving sewer service.

3.1.15 Influent Sewer Lines

3.1.15.1 Velocity in the influent sewer shall be minimum scouring velocity.

3.1.15.2 The required sanitary storage volume must be provided entirely within the wet well.

3.1.15.3 Only one inlet connection shall be permitted to a wet well.

3.1.15.4 Any additional influent lines shall be combined into a manhole upstream of the wet well.

3.1.16 Sump Design

3.1.16.1 The sump design shall be an integral part of the pump station.

3.1.16.2 Proper pump performance depends on correct sump design, which will also reduce cost of operation and maintenance.

3.1.16.3 Ideally, the flow of water into any pump shall be uniform, steady, without swirl and without entrained air.

3.1.16.4 Unsteady flow will lead to mechanical problems in the pump and air entrainment will lead to cavitation in the pump.

3.1.16.5 All sumps shall be designed in accordance with the manufacturer’s recommendations.

3.1.17 Buoyancy Protection

3.1.17.1 Structures shall be designed to counteract buoyant forces.

3.1.17.2 Below-ground pump station structures shall be protected from the buoyant forces of groundwater.

3.1.17.3 Buoyancy protection for wet wells shall be demonstrated through the use of flotation calculations.

A. Developer's Engineer, a Professional Engineer registered in the State of Georgia, shall be responsible to verify that the structure is protected from floatation.

B. A geotechnical analysis shall be performed to gather groundwater and soil data.

C. Flotation calculations shall be performed on below-ground pump station structures using groundwater table elevation determined from the geotechnical analysis.

D. Flooding conditions shall also be designed for.

E. Buoyancy forces shall be computed by multiplying the volume displaced by the wet well by the associated weight in water.

F. Counteracting force shall be computed by adding the weights of the entire structure including that of the wet well barrel, bottom slab, top slab, superstructure if any, the net weight of the saturated soil over the bottom slab and any additional restrains

G. Flotation calculations shall not add the weight of the pumps, internal piping and appurtenances, or wastewater present in the pump station, including the wastewater below the all pumps-off activation level, into the downward forces used to counteract buoyancy.

H. The use of the saturated weight of any soil above the extended footing of the pump station structure to the groundwater table elevation will be allowed in the flotation calculations.

3.1.17.4 Flotation calculations shall show that the design of the below-ground pump station structures will be protected from buoyancy with a factor of safety that is equal to or greater than one.

A. The factor of safety should be 1.5 or greater which shall be obtained by dividing the counteracting force by the buoyant force.

3.1.17.5 An anti-flotation collar at the base of the pump station may be used to offset the buoyancy force.

3.1.17.6 Pressure relief valves shall not be used.

3.1.18 Pump Cycle Time

3.1.18.1 Pumps shall be cycled such that the numbers of starts are minimized and resting times are maximized to avoid overheating and overstressing of the pump motor.

A. The minimum time between pump starts shall be ten (10) minutes.

B. The minimum cycle time occurs in a two (2) pump system when the inflow is at half the peak flow.

C. Automatic pump alternation of the starting order of the pumps after shutoff is required and will provide longer cycle times and rest times.

3.1.19 Pump Control Elevations

3.1.19.1 Within the wet well, there shall be set elevations for the following conditions:

A. High Level Alarm

B. Lag Pump On

C. Lead Pump On

D. All Pumps Off

E. Low Level Alarm

3.1.19.2 Pumping Sequence

A. The lead pump is energized when the wastewater level reaches the **lead pump-on** elevation.

B. The lead pump shall operate continuously until the water level is lowered to the **all pumps off** elevation.

C. The lag pump shall be energized if the lead pump is incapable of handling the flow of wastewater, allowing the water level to reach the **lag pump-on** elevation.

D. The lag pump shall then operate in unison with the lead pump until the water level is lowered to the **all pumps-off** elevation when both pumps are de-energized.

E. An automatic circuit shall be provided to alternate the lead pump and lag pump sequence on every pump down cycle.

F. A time delay relay shall be provide to prevent both lead and lag pumps from starting at the same time.

3.1.19.3 Storage in the wet well shall be provided above the high-level alarm equal to three (3) hours at design flow.

A. Storage volume is calculated to be that volume between the **high-level alarm** and the lowest point of overflow and includes volume in the wet well and gravity sewer.

B. The location of the lowest point of overflow shall be noted in the Design Review and Approval Submittal.

3.1.19.4 The **high water alarm** elevation shall be set to provide one foot of freeboard below the influent sewer pipe.

3.1.19.5 The **lag pump-on** elevation shall be set at a minimum of six (6) inches below the **high water alarm** elevation.

3.1.19.6 The **lead pump-on** elevation shall be set at the elevations that satisfy the individual pump cycling volumes.

3.1.19.7 The wet well active volume is obtained using the equation provided in Section 5, Paragraph 3.1.7.1.

3.1.19.8 The **all pumps-off** elevation shall be no lower than the lower of either the pump discharge flange elevation or manufacturer’s minimum recommended level.

3.1.19.9 The **low level alarm** elevation shall be set six (6) inches below the all pumps off elevation.

3.1.20 Water-Level Sensors

3.1.20.1 Floats and probes shall be installed at the closest accessible location.

3.1.20.2 The water-level sensors activate the pumps and, therefore, are a vital component of the control system.

A. FCPW will allow only electronic sensors.

B. Sensors shall be continuous water level measuring devices and shall be hydrostatic transducer as primary and ultrasonic transducer as a backup.

C. Float switches shall not be used for pump control.

3.1.20.3 The signals from these sensors are inputted to a PLC which will control the starting and stopping of the pump motors.

3.2 Materials of Construction

3.2.1 Acceptable materials of construction include:

3.2.1.1 Precast concrete

3.2.1.2 Cast-in-place concrete

3.2.1.3 Fiber reinforced polyester (FRP)

3.2.1.4 High density polyethylene (HDPE)

3.2.2 Precast Concrete

3.2.2.1 Precast concrete section shall meet the requirements of the following applicable standards:

A. ASTM C478 “Standard Specification for Precast Reinforced Concrete Manhole Sections”

B. ASTM C913 “Standard Specification for Precast Concrete Water and Wastewater Structures”

C. ASTM C858 “Standard Specification for Underground Precast Concrete Utility Structures”

D. ASTM C923 “Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Laterals”

E. ASTM C990 “Standard Specification for Joints for Concrete Pipe, Manholes and Precast Box Sections Using Preformed Flexible Joint Sealants”

3.2.2.2 Precast concrete wet wells shall consist of pre-cast reinforced polymer concrete sections and a flat slab top section with access hatches, as required.

A. The minimum compressive strength of the concrete for all sections shall be 4,000 psi.

B. Concrete for wet wells shall be Type II, four thousand (4,000) psi at twenty-eight (28) days.

C. The maximum allowable absorption of the concrete shall not exceed 8 percent of the dry weight.

D. The circumferential reinforcement in the riser sections and base wall sections shall consist of one line of steel and shall be not less than 0.20 square inches per linear foot.

E. The ends of each reinforced concrete riser section and the bottom end of the top section shall be so formed that when the risers and the top are assembled, they will make a continuous and uniform wet well.

3.2.2.3 Pre-cast wet wells shall be constructed with a monolithic base structure as shown in Standard Detail P-014, Appendix B.

3.2.2.4 Wet well sections

A. The minimum wet well diameter shall be eight (8) feet.

B. The minimum wall thickness shall be eight (8) inches for all wet wells.

C. The minimum pre-cast base section thickness shall be twelve (12) inches

D. The pre-cast top slab shall have minimum thickness of ten (10) inches.

E. The date of manufacture and the name or trademark of the manufacturer shall be clearly marked on each pre-cast section.

F. Pre-cast wet well section shall be handled by lift rings or non-penetrating lift holes

G. Each section of the precast wet well shall have not more than two holes for the purpose of lifting, handling and installing.

1) These holes shall be tapered and shall be plugged with mortar after installation.

H. The first pre-cast sections shall be placed and carefully adjusted to true grade and alignment.

I. The sections shall be uniformly supported by the base structure and shall not bear directly on any of the pipes.

J. The completed wet well shall be rigid, true to dimensions and watertight.

K. Pre-cast sections shall be placed and aligned to provide vertical alignment with a one-quarter (1/4) inch maximum tolerance per five (5) feet of depth.

3.2.2.5 Base sections shall be placed on bedding rock.

A. The bedding rock shall be firmly tamped and made smooth and level to assure uniform contact and support of the pre-cast structure.

B. The pre-cast base section shall be carefully placed on the prepared bedding so as to be fully and uniformly supported in true alignment and making sure that all entering pipes can be inserted on proper grade.

3.2.2.6 Section Joints

A. Barrel, top and base sections shall have tongue and groove joints.

B. Section shall be joined using an approved preformed plastic gasket meeting the requirements of Federal

Specifications SS-S-00210, "Sealing Compound, Preformed Plastic for Pipe Joints", Type 1, Rope Form

C. Joints shall be sealed with epoxy grout on both the internal and external walls for a smooth continuous wall

3.2.2.7 If wet well base or cone are to be cast in place, Number 5 (#5) rebar at twelve (12) inch off-center will be anchored as dowel bars to ensure monolithic construction.

A. Wet well top slab shall extend minimum three (3) inches above the pump station pad.

3.2.2.8 If ground water is encountered during construction of the wet well, a six (6) inch perforated drain pipe surrounded by Number 57 (No. 57) Stone and wrapped with filter fabric shall be installed.

A. The perforated drain pipe is to begin at the wet well base, slope downward and discharging to daylight as low as possible per geotechnical.

3.2.3 Cast-in-place concrete

3.2.3.1 Concrete mix design shall be in accordance with ACI 318 and ACI 350.

A. 28-Day Strength: 4,000 PSI.

B. Cement Content: Minimum 560 pounds per cubic yard.

C. Air Content: 5% to 7% in accordance with ASTM C231.

D. Water to Cement Ratio: Maximum 0.44.

E. Slump Range: 3 to 5 inches in accordance with ASTM C143.

F. Use of fly ash shall be approved by FCDPW Construction Project Manager.

G. Use of admixtures shall be approved by FCPW Construction Project Manager.

3.2.3.2 Materials

A. Cement: Domestic Portland cement in accordance with ASTM C150, Type II.

B. Fine Aggregate: Washed, inert, natural sand in accordance with ASTM C33.

C. Coarse Aggregate: Number 57 (No. 57) stone in accordance with ASTM C33.

D. Water: Clean, potable water free from injurious amounts of oils, acids, alkalis, salts, organic matter, or other deleterious substances.

3.2.3.3 Reinforcement

A. Steel reinforcing bars shall be in accordance with ASTM A615, Grade 60.

B. Welded wire reinforcement shall be in accordance with ASTM A185.

3.2.4 Fiber reinforced polyester (FRP)

3.2.4.1 General

A. Fiberglass reinforced polyester wet wells shall be manufactured from commercial grade polyester resin or vinyl ester resin, with fiberglass reinforcements.

B. The resin system shall be suitable for atmospheres containing hydrogen sulfide and dilute sulfuric acid as well as other gases associated with the wastewater collection systems.

C. The wet well shall be of one-piece unit construction.

3.2.4.2 Materials

A. Resin: The resins used shall be a commercial grade unsaturated polyester resin.

B. Reinforcing Materials:

1) The reinforcing materials shall be commercial Grade "E" type glass in the form of mat, continuous roving, chopped roving, roving fabric or a combination of the above, having a coupling agent that will provide a suitable bond between the glass reinforcement and the resin.

C. Surfacing Material:

1) If reinforcing materials are used on the surface exposed to the wastewater, it shall be a commercial grade chemical-resistant glass that will provide a suitable bond with the resin and leave a resin rich surface.

D. Fillers and Additives:

1) Fillers, when used, shall be inert to the environment and wet well construction.

2) Additives, such as thixotropic agents, catalysts, promoters, etc., may be added as required by the specific manufacturing process to be used. The resulting reinforced plastic material must meet the requirement of this specification.

3.2.4.3 Fabrication

A. Exterior Surface:

1) The exterior surface shall be relatively smooth with no sharp projections. Handwork finish is acceptable if enough resin is present to eliminate fiber show.

2) The exterior surface shall be free of blisters larger than 1/2 inch in diameter, delamination and fiber show.

3) For a UV inhibitor the resin on the exterior surface of the wet well shall have gray pigment added for a minimum thickness of 0.125 inches.

B. Interior Surface:

1) The interior surface shall be resin rich with no exposed fibers.

2) The surface shall be free of grazing, delamination, blisters larger than 1/2 inch in diameter and wrinkles of 1/8 inch or greater in depth.

3) Surface pits will be permitted up to 6 square feet if they are less than 3/4 inch in diameter and less than 1/16 inch deep.

C. Fiberglass Reinforced Bottom:

1) The bottom shall be fabricated using fiberglass material as identified above.

2) Bottom to be attached to wet well walls with fiberglass layup to comply with ASTM-D3299 specifications.

3) When reinforcement is necessary for strength, the reinforcement shall be fiberglass channel laminated to wet well bottom per ASTM-D3299.

D. Integral Internal Fiberglass Fillet:

1) Fiberglass wet wells may have an internal sloped fillet bottom.

2) The fillet shall be constructed of the same fiberglass material as the wet well and shall be integral to the wet well.

3) The fiberglass fillet shall have a 1:1 slope and shall not interfere with pump mounting in the wet well.

E. Fiberglass Reinforced Top:

1) The fiberglass wet well top shall be fabricated using fiberglass material as identified above.

2) Top to be attached to wet well pipe with fiberglass layup to comply with ASTM-D3299 specifications.

3) When reinforcement is necessary for strength, the reinforcement shall be fiberglass channel laminated to wet well top per ASTM-D3299.

F. Installation of Stubouts:

1) Influent or discharge lines may be factory installed.

2) Approved methods are PVC sewer pipe, Inserta-Tee fittings or Kor-N-Seal boots.

3) Installation of stubouts to be fiberglass layup to comply with ASTM-D3299 specifications.

G. Defects Not Permitted:

1) Exposed fibers: glass fibers not wet out with resin.

2) Resin runs: runs of resin and sand on the surface.

3) Dry areas: areas with glass not wet out with resin.

4) Delamination: separation in the laminate.

5) Blisters: light colored areas larger than 1/2 inch in diameter.

6) Crazing: cracks caused by sharp objects.

7) Pits or Voids: air pockets.

8) Wrinkles: smooth irregularities in the surface.

9) Sharp projection: fiber or resin projections necessitating gloves for handling.

3.2.4.4 Physical Requirements

A. Load Rating:

1) The complete wet well shall have a minimum dynamic-load rating of 16,000 ft-lbs when tested in accordance with ASTM-D3753.

2) To establish this rating, the complete wet well shall not leak, crack or suffer other damage when load tested to 40,000 ft-lbs and shall not deflect vertically downward more than 1/4 inch at the point of load application when loaded to 24,000 lbs.

B. Stiffness:

1) The wet well cylinder shall have a minimum pipe-stiffness value shown in the table below when tested in accordance with ASTM-D3753

LENGTH - FT.	**F/AY - PSI**
10 to 20	2.01
21 to 30	3.02
31 to 40	5.24

C. Physical Properties

	Hoop Direction	**Axial Direction**
Tensile Strength (psi)	18,000	5,000
Tensile Modules (psi)	0.8×10^6	0.7×10^6
Flexural Strength (psi)	26,000	4,500
Flexural Modules (psi)		
(no ribs - 48", 60", 72") (psi)	1.4×10^6	0.7×10^6
(with ribs - 96", 144") (psi)	0.7×10^6	0.7×10^6

3.2.5 HDPE

3.2.5.1 The following table lists standards associated with this section:

RESIN STANDARDS	ASTM D3350	“Standard Specification for Polyethylene Plastics Pipe and Fitting Materials”.
	ASTM F412	“Standard Terminology Relating to Plastic Piping Systems”.
	ISO 4427-1	“Plastics piping systems – Polyethylene (PE) pipes and fittings for water supply – Part 1: General”.

DIMENSIONS AND MANUFACTURING	ASTM F714	“Standard Specification for Polyethylene (PE) Pipe (SDR-PR) Based on Outside Diameter”.
	ASTM D2513	“Standard Specification for Thermoplastic Gas Pressure Pipe, Tubing and Fittings”.
	ASTM D3035	“Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter”.
	ASTM F2619	“Standard Specification for High Density Polyethylene (PE) Line Pipe”.
	ISO 4427-1	“Plastic piping systems – Polyethylene (PE) pipes and fittings for water supply – Part 2: Pipes”.

3.2.5.2 The products used in the fabrication of the wet well structures shall conform to the following requirements:

A. HDPE extruded solid wall pipe requirements:

1) Solid wall pipe shall be used for wet wells up to 96 inches in diameter and shall be a minimum grade of PE 4710 with a minimum cell classification value of 445474C per ASTM D3350.

2) Pipe shall be manufactured in conformance with the standard of ASTM F714.

3) Dimension Ratio (DR) and Outside Diameter (IPS/DIPS) shall be as specified on plans.

B. HDPE profile wall pipe requirements:

1) Profile wall pipe shall be used for wet wells up to 120 inches and shall be manufactured to the dimensions and material requirements of ASTM F894 with a minimum cell classification value of 334433C per ASTM D3350.

C. HDPE sheet material Requirements:

1) HDPE sheet or plate shall be of pipe grade material with a minimum equivalent designation of PE 3608 or a minimum cell classification value of 345464C per ASTM D3350.

D. HDPE fitting requirements:

1) HDPE fittings shall be of a minimum grade of PE 4710 with a minimum cell classification value of 445474C per ASTM D3350

2) HDPE fittings shall conform to either ASTM D3261 for molded or machined fittings and ASTM F2206 for fabricated fittings.

3.2.5.3 HDPE Fabrication Requirements

A. The fabricator shall construct the HDPE wet well structures based on FCPW approved drawings.

B. The inlets and outlets shall be extrusion welded on the inside and outside of the structure, where access is available.

1) Two gussets shall be provided for 2”-8” extrusion welded inlets and outlets.

2) Four gussets shall be provided for 10” and larger extrusion welded inlets and outlets unless impractical.

C. Wet well connections larger than 4” nominal OD pipe shall be joined by the following methods:

1) Butt fusion

2) Electrofusion

3) Flanged connections using an HDPE flange adapter and metallic backup ring having a bolt pattern per ASME B16.5 or B16.47 Series A.

D. For 4” OD pipe and smaller, threaded transition fittings may be used in addition to those connections specified for 4” and larger.

E. Employing mechanical couplings or similar connections requires approval by the FCPW.

F. Make all butt fusion welds in accordance with ASTM F2620.

1) All butt fusion welds performed with hydraulically operated butt fusion equipment shall be recorded using a data acquisition device.

2) The fabricator shall maintain records of the temperature, pressure and graph of the fusion cycle for a minimum of 3 years.

G. Lifting eyes provided shall be integral to the wet well structure body and the locations of which shall be accurately indicated on shop drawings.

H. Wet well structure and outlets shall not be used as anchor points against excessive axial loads or movement.

1) When expecting large changes in temperature, design restraints to isolate the structure and prevent strain at the inlets or outlets.

2) Cast restraints into a concrete block or collar around the pipe.

I. As an integral part of the wet well structure, anti-flotation and/or anti-settling measures such as anchor lugs, rings, or collars shall be provide.

J. Reinforced concrete pads at surface level spanning the HDPE wetwell structure footprint shall be provided when used in traffic areas.

1) The pad shall transfer live loads to the surrounding fill and remove direct loading to the wet well structure riser or manway.

2) A Professional Engineer registered in the State of Georgia shall design the concrete pad.

3) Integration of the pad with the wetwell structure shall be coordinated with the manufacturer.

K. Equipment Mounting

1) Special provisions shall be provided when mounting pumps in an HDPE wet well structure.

2) Bolting directly to the wall of the HDPE structure is not permitted.

L. The wetwell structures shall be factory tested in accordance with ASTM F2164. FCPW may request to observe the test.

1) Pressure rated vessels may be tested with a hydrostatic pressure test. Minimum test duration will be one hour. Maximum test duration will be three hours.

2) When approved, conduct a water fill test by filling the structure and checking for leaks.

3) Approval drawings and testing documents will specify the level of water and test duration.

4) Minimum test duration will be one hour.

5) A low-pressure air test may be used instead of testing with water using a minimum of 1 psi test pressure for 15 minutes.

3.2.5.4 Direct Burial Installation

A. Trench Construction: Construct the trench and trench bottom in accordance with ASTM D2321.

B. Install the HDPE wet well structure on a concrete pad or a stable base consisting of 12” of Class I materials compacted to 95% proctor density per ASTM F1759.

C. Embedment materials:

1) Embedment materials shall be Class I or Class II materials as defined by ASTM D2321.

2) Class I or flowable fill (controlled low strength material /CLSM) materials are preferred.

3) Backfill and bedding materials shall be free of debris.

D. Bed and compact beneath the manhole or structure in accordance with ASTM D2321.

E. Backfilling shall be shall be done to conform to the ASTM F1759.

1) Backfill should extend at least 3.5 feet beyond the edge of the wet well structure for the full height of the structure and extend laterally to undisturbed soils.

2) Compaction shall be minimum 90% proctor density with a minimum fill modulus of 1000 psi.

3.3 Piping Penetrations

3.3.1 For precast concrete wet wells, pipe penetrations shall be sealed with the following methods using resilient connectors:

3.3.1.1 A-Lok Products, Inc.

3.3.1.2 Trelleborg Pipe Seals

3.3.1.3 Link-Seal by GPT Industries

3.3.1.4 FCPW approved equal.

3.3.2 For cast-in-place concrete wet wells, pipe penetrations shall be sealed with the following methods.

3.3.2.1 Cast-in-place wall pipe with water collar.

3.3.2.2 Cast-in-place in wall sleeve water collar, with Link-Seal by GPT Industries and non-shrink grout on inside face.

3.3.3 For HDPE or FRP wet wells, pipe penetrations shall be made in accordance with the above or the manufacturer's recommended procedures.

PART 4 VALVE AND METER VAULT DESIGN

4.1 General

4.1.1 All wastewater pump stations shall have a combined below grade valve and meter vault, separate from, but immediately adjacent to the wet well.

4.1.2 Guidelines for proper design of the valve and meter vault include the following:

4.1.2.1 Valve and meter vault, pumping station, and other main structures shall be located minimum five (5) feet apart.

4.1.2.2 Valve and meter vaults are to be constructed of precast or cast-in-place concrete.

4.1.2.3 Valve and meter vaults shall generally be no less in width as the wet well.

4.1.2.4 There shall be a minimum of 2 feet of clearance around flanges for pipe 8 inches and smaller and a minimum of 3 feet for pipe larger than 8 inches.

4.1.2.5 Valve and meter vaults shall be provided with double leaf aluminum access hatches meeting the requirements described in Paragraph 5.1.

A. Valves and flow meters shall be located directly under hatch openings.

B. Valves shall be operational from the ground surface without the need of entering the vault.

C. Flow meters and pressure gauges shall be readable from the ground surface without the need of entry.

D. Piping and appurtenances within the valve and meter vault shall be set three (3) feet above floor elevation and shall be provided with stainless steel pipe supports.

E. Piping within the valve vault shall be minimum three (3) feet below the ground surface.

4.1.2.6 Pipe penetrations shall be per Paragraph 3.3.

4.1.2.7 No manhole steps shall be installed in valve and meter vaults

4.1.2.8 The discharge piping from each pump shall be routed through the valve and meter vault with check valves and shutoff valves on horizontal stretches of pipe, to prevent solids from settling back on the check valve.

4.1.2.9 Check valves shall be placed upstream of shutoff valves.

4.1.2.10 A flow meter shall be installed downstream of the valves in the valve and meter vault.

A. The length of force main between the meter and the valves shall be straight, in accordance with the manufacturer's recommendations, with no bends or fittings in the line, to reduce turbulence of the wastewater entering the flow meter.

4.1.2.11 Pressure gauges shall be installed within the valve and meter vault.

A. The pressure gauge tap with diaphragm mounted seals shall be located on the side of each pipe in the valve and meter vault, see Standard Detail P-014 in Appendix B for placement.

B. Gauge gradation shall not be more than one hundred and twenty percent (120%) of the maximum pressure anticipated at the pump station.

C. Pressure gauge face shall be four (4) inches minimum and installed facing up toward to the access hatch. The pressure gauge shall be easily read by looking down into the valve and meter vault.

4.1.2.12 The valve and meter vault shall have a concrete floor with concrete sides and two aluminum hatches. The floor shall be sloped at two percent (2%) to a sump to collect rainwater.

4.1.2.13 All pipes, valves, meters and fittings within the vault shall receive, after installation, one (1) three (3) mil coat of suitable primer and one (1) three (3) mil coat of suitable **gray** paint.

4.1.2.14 The exterior of the vault shall receive two (2) coats of three (3) mils epoxy.

4.1.2.15 Vault top slab shall extend minimum three inches above the pump station pad.

4.1.2.16 A sump shall be provided in the valve and meter vault to collect rain and wash-down water.

4.1.2.17 Valve and meter vaults shall be considered confined spaces.

A. Adequate means for ingress and egress, including OSHA approved ladders or steps and access hatches of sufficient size, shall be required.

B. There shall be at least twelve (12) inches between the edge of the vault ladder and the pipe wall to provide ease of access.

C. The OSHA approved aluminum access ladder shall be installed from the access hatch to one (1) foot above the floor inside the vault and extend no less than two (2) feet above the hatch when fully extended.

D. Vaults shall be sized to accommodate this requirement.

E. Where access ladder is not provided, adequate room shall be allowed to place safely a temporary ladder and a 2-foot minimum clearance.

4.1.2.18 Size shall allow for personnel to enter and work.

A. Vault shall provide additional openings to allow for forced air ventilation.

B. Clearance shall be provided between flanges and vault floor and walls to allow for use of tools and wrenches sized for the flange bolts.

4.1.2.19 Piping and valves may be allowed to be installed above ground (not inside a vault) if suitable freeze protection and protection against vandalism is provided.

A. In such case, valves shall be installed over a containment pad.

PART 5 PUMP STATION EQUIPMENT AND MATERIALS

5.1 Access Hatches

5.1.1 Access hatches shall be of double leaf aluminum construction and sized appropriately per the equipment manufacturers recommendation to allow adequate clearance for easy removal of the pumps and other equipment.

5.1.2 Exterior access hatches shall be water tight aluminum hatches.

5.1.3 Access hatch shall be provided with the following:

5.1.3.1 Hinges with tamper proof bolts.

5.1.3.2 Automatic hold open arm and a flush aluminum drop handle.

5.1.3.3 All hardware shall be Type 316 stainless steel.

5.1.3.4 Hatches shall be rated for a live load of 300 psf except as specified below.

5.1.3.5 Hatches located within an area accessible by vehicle shall be rated for H20 loads.

5.1.3.6 All hatches shall have a recessed pad lock box to allow for secure locking of the hatch without presenting a potential trip hazard.

5.1.4 Provide two (2) hatch keys for hatch locking devices

5.2 Safety Grates

5.2.1 All access hatches shall be equipped with metal safety grates with safety latches.

5.2.2 Each safety grate shall be designed to combine covering of the opening, fall through protection per OSHA Standard 1910.23 and controlled confine space entry per OSHA Standard 1910.146.

5.2.2.1 Welding shall be in accordance with ANSI/AWS D1.2-90 Structural Welding Code for Aluminum.

5.2.3 The safety grate shall be made of 6061-T6 aluminum with a minimum ultimate strength of 38,000 psi and a minimum yield strength of thirty-five thousand (35,000) psi, as per A.S.T.M. B221.

5.2.4 Grate design shall use safety factors as defined in the “Specifications for Aluminum Structures, 5th addition, by the Aluminum Association, Inc. for “Bridge Type Structures”.

5.2.5 Grating shall be designed to withstand a minimum live load of three hundred (300) pounds per square foot. Deflection shall not exceed 1/150th of the span.

5.2.6 Grate opening shall be five (5) inch by five (5) inch, with banding, which will allow for visual inspection, limited maintenance and float adjustments while the safety grate fall through protection is left in place.

5.2.7 Design must assure that the fall through protection is in place before the doors can be closed, thereby protecting the next operator.

5.2.8 Each grate shall be provided with a permanent hinging system, which will lock the grate in the ninety (90) degree position once opened.

5.2.8.1 Grates in the open position create a physical barrier around the opening, protecting passing pedestrians.

5.2.9 Each grate shall have an opening arm, which will allow opening of the grate, while providing the grate as a barrier between the operator and the pit.

5.2.9.1 The opening arm shall also be equipped with a controlled confined space entry lock.

A. This locking device will prevent unauthorized entry to the confined space.

5.2.9.2 The grating system will allow anyone to make visual inspection and float adjustments without entering the confined space.

5.2.10 Grate shall be coated with an OSHA typed safety orange color, promoting visual awareness of the hazard.

5.2.10.1 The aluminum safety grates shall receive a two-coat powder coat system, applied by the electrostatic spray process.

5.2.10.2 The base coat is a thermosetting epoxy powder coat finishes with a minimum thickness of two (2) to four (4) mils.

5.2.10.3 The topcoat is a mar-resistant, TGIC polyester powder coating with a minimum thickness of two (2) to four (4) mils.

5.2.10.4 Each coat shall be baked at 350-375 degrees F until cured.

5.2.11 Safety grates shall have a rated capacity to support expected loadings and shall be designed not to interfere with the removal of the pumps or other equipment.

5.2.12 Acceptable hatch manufacturers include:

5.2.12.1 Halliday Products

5.2.12.2 Bilco

5.2.12.3 FCPW approved equal

5.3 Piping

5.3.1 Pipe diameter shall be larger than the diameter of the maximum solid size that is passed by the pumps present in the pump station.

5.3.1.1 The minimum allowable force main size is six (6) inches and the minimum allowable solid size that the pumps shall be able to pass is six (6) inches.

5.3.1.2 Size the pipe to achieve a flow velocity between three (3.0) and six (6.0) feet per second.

5.3.2 Wet Well Discharge Piping

5.3.2.1 Each pump shall have a separate discharge line from the base elbow in the wet well and through the valve and meter vault to a point minimum three (3) feet past the exterior of discharge side of the vault.

5.3.2.2 Discharge piping shall be DIPS DR 11 HDPE. Ductile iron pipe may be used only with FCPW's specific approval. These discharge lines shall be of a minimum six (6) inches in size.

5.3.2.3 All inlet pipes shall be properly installed so as to form an integral watertight unit.

5.3.2.4 All pipes, valves and fittings, unless otherwise stated, shall have flanged ends.

5.3.2.5 All bolts, nuts and washers used to connect these flange ends shall be of type 316 stainless steel.

5.3.2.6 All pipe valves and fittings shall be installed as indicated in Standard Detail P-014, Appendix B.

5.3.2.7 For pump stations less than eighteen (18) feet deep, each vertical discharge pipe in the wet well shall be of one (1) piece, continuous length.

A. If the depth of the wet well exceeds eighteen (18) feet, flange pipe connections shall be used to connect the riser pipes.

1) 314 SST pipe supports restraining the pipe to the wall of the wet well shall be used every five (5) feet.

B. Under no condition shall adapter flanges be permitted in the wet well.

5.3.2.8 Where DIP has been approved for use by FCPW:

A. All pipes, valves and fittings shall be epoxy lined.

B. All pump discharge pipes and fittings within the wet well shall receive, after installation, two (2) coats of epoxy paint. Each coat shall be eight (8) mil dry thick.

5.3.3 Yard Piping

5.3.3.1 A bypass connection shall be installed on the force main in the valve and meter vault so emergency bypass pumping may be performed.

5.3.3.2 The bypass line shall have quick disconnect equal to the size of the force main and have a plug valve and a check valve.

5.3.4 All piping from the pump suction to connection to the force main shall be ductile iron pipe (DIP).

5.3.4.1 Pipe thickness, coatings and linings shall be determined based on conditions of service.

5.3.4.2 No Uni-flange or Mega-flange types will be allowed.

5.3.5 A restrained solid sleeve flex joint shall be used between the wet well and valve and meter vault per Detail P- 014.

5.3.6 The following table lists standards associated with this section

Reference	Title
ANSI B16.1	Cast Iron Pipe Flanges and Flanged Fittings Class 25, 125, 250, and 800
ANSI B16.5	Pipe Flanges and Flanged Fittings
AWWA C110 (ANSI A21.10)	Ductile-Iron and Gray-Iron Fittings, 4 In. Through 48 In., for Water and Other Liquids
AWWA C153 (ANSI A21.53)	Ductile-Iron Compact Fittings, 4 In. Through 64 In
AWWA C111 (ANSI A21.11)	Rubber-Gasket Joints for Ductile- Iron and Gray-Iron Pressure Pipe and Fittings
AWWA C115 (ANSI A21.15)	Flanged Ductile-Iron Pipe With Threaded Flanges
AWWA C150 (ANSI A21.50)	Thickness Design of Ductile-Iron Pipe
AWWA C151 (ANSI A21.51)	Ductile-Iron Pipe, Centrifugally Cast, in Metal Molds or Sand-Lined Molds, for Water or Other Liquids

5.3.7 Ductile Iron Pipe shall meet the requirements of ANSI/AWWA C150/C151 and ANSI/AWWA C115 for flanged pipe.

5.3.7.1 The required pipe class shall be such that the “manufacturer’s allowable working pressure” meets the greater of the following two conditions:

A. A minimum of twice the design working pressure

B. One and one half times the design surge pressure, whichever is greater.

5.3.7.2 Flanged DIP shall be a minimum Thickness Class 53.

5.3.8 Ductile iron fittings shall meet the requirements of ANSI/AWWA C110.

5.3.8.1 All exposed, including all unburied and submerged joints, pipe fittings shall be flanged.

5.3.8.2 Flanged fittings shall be flat faced.

5.3.8.3 Gasket material shall be a synthetic rubber compound in which the elastomer is nitrile or neoprene.

A. Gaskets for plain faced flanges shall be the full face type.

B. Thickness shall be 1/8 inches.

5.3.8.4 Flange assembly bolts shall be as recommended per the joint specification.

A. Bolts for submerged service shall be made of Type 316 stainless steel in conformance with ASTM F593.

B. Where washers are required, they shall be of the same material as the associated bolts.

5.3.9 Linings

5.3.9.1 DIP and fittings shall have a corrosion resistant internal lining. Linings shall be double thickness PROTECTO 401 Ceramic Epoxy or approved equal.

5.3.9.2 Conditions of service may necessitate other specialized coatings or linings.

5.3.10 Coating

5.3.10.1 The exterior of ductile iron pipe shall be coated with a layer of arc-sprayed zinc per ISO 8179.

5.3.10.2 The mass of the zinc applied shall be 200 g/m^2 of pipe surface area.

5.3.10.3 A finishing layer of bituminous topcoat shall be applied to the zinc.

5.3.10.4 The coating system shall conform in every respect to ISO 8179-1 “Ductile iron pipes – External zinc-based coating - Part 1: Metallic zinc with finishing layer. Second edition 2004- 06-01.”

5.3.10.5 An additional spray on epoxy coating shall be applied to all pipe and fittings inside the wetwell.

5.4 Equipment Connection Fittings

5.4.1 Shall be required:

5.4.1.1 To permit easy disassembly and reassembly

5.4.1.2 To provide misalignment adjustment between equipment connection flanges and the connection to field piping.

5.4.1.3 To provide full pressure thrust restraint between the field piping connection and equipment connection flanges.

5.4.1.4 To Impede the transmission of damaging forces.

5.4.1.5 To connect the magnetic flowmeter.

5.4.2 Equipment connection fittings shall be Romac ECF400 Series or equal.

5.4.2.1 Equipment connection fittings shall each conform to the requirements of the specified piping system of sufficient length to span the gap between the connection at the equipment and the connection at the field piping with gasketed flange adapters at each end.

5.4.2.2 Pressure rating of flange adapters shall equal or exceed the pressure rating of mating flanges.

5.4.2.3 All metal portions of equipment connection fittings, with the exception of 316 stainless steel components, shall be coated and lined with fusion bonded epoxy conforming to AWWA.

5.5 Valves

5.5.1 Valves are specifically prohibited from being installed in the wet well.

5.5.2 Check Valves

5.5.2.1 Furnish and install check valves for each pump discharge.

5.5.2.2 When a pumping station is constructed, a check valve shall be installed on each pump discharge pipe, five (5) feet upstream of the joining wye or tee.

5.5.2.3 This shall allow for the isolation of each individual pump of the station.

5.5.2.4 Check valve shall be installed inside the valve and meter vault.

5.5.2.5 Pump discharge check valves shall be spring loaded or weight-and-lever type swing check valves.

5.5.2.6 Swing check valves shall be selected to best suite their installation type.

5.5.2.7 The valves shall be designed, manufactured and tested in accordance with the following Standards:

A. American Water Works Association Standard ANSI/AWWA C508.

B. Manufacturers Standardization Society Standard Practice MSS SP-136.

5.5.2.8 Swing check valves shall be of the full waterway body type with drain ports and domed access covers and vent port.

5.5.2.9 A side oil dampener shall be provided on valves sizes 8-inch and larger.

5.5.2.10 Swing check valves shall be Val-Matic series 7900, APCO series 6000/6000A, or approved equal.

5.5.3 Isolation Valves

5.5.3.1 Acceptable isolation valve shall be plug valves.

5.5.3.2 All pump stations shall have plug valves installed at the following locations:

A. On the discharge pipe of each pump.

B. On the by-pass piping connection.

C. Between the flowmeter and fence (at the point of connection between the pump station piping and force main.)

D. Additional locations as shown on the Drawings.

5.5.3.3 On force mains exceeding five thousand (5,000) feet, isolation valves shall be required for each two thousand and five hundred (2,500) feet to facilitate future repairs and shall be coordinated with ARV locations.

5.5.3.4 All buried isolation valves shall be located inside a standard valve box with a valve marker.

5.5.3.5 The valve marker shall clearly denote “Sanitary Sewer Force Main”.

5.5.3.6 An 18” square concrete pad shall be provided around each valve cover for buried valves.

5.5.3.7 Plug valves shall meet the following requirements:

A. General

1) Plug valves shall be non-lubricated, resilient-seated, eccentric valves.

2) Pressure ratings shall be 175 psi on valve sizes through 12-inch and 150 psi for 14-inch and larger.

3) Valve pressure ratings, body flanges and wall thicknesses shall be in full conformance with ANSI B16.1, latest revision.

4) Valves shall seal leak-tight against full rated pressure in both directions.

5) Valve seats shall be tested to provide leak tight shut-off to one hundred and seventy-five (175) psi for valves through twelve (12) inch with pressure in either direction.

6) In addition, every valve shall be given a certified hydrostatic shell test and seat test, with the plug open, to a pressure twice that of rating specified above to demonstrate overall pressure integrity of the valve body. Test reports shall be available upon request by the FCPW.

7) Plug valves shall conform to the latest revision of ANSI/AWWA C517-05.

8) All materials shall be new.

9) Valves and operators shall have seals on all shafts and gaskets on valve actuator covers to prevent the entry of water. Actuator mounting brackets shall be totally enclosed and shall have gasket seals.

10) All buried valves shall have mechanical joint ends conforming to ANSI/AWWA C111/A21.11.

11) All exposed valves measuring 4 inches in diameter and larger shall have Class 125 flat face flanged ends, at a minimum, conforming to ANSI B16.1 or ANSI/AWWA C110/A21.10.

12) Plug valve and connecting pipe shall have the capability to be pigged without the use of special equipment.

13) A valve key for plug valves shall be provided to FCPW for each pump station.

B. Plugs

1) Shall be solid one piece, Cast Iron ASTM A126 Class B or Ductile Iron ASTM A536 Grade 65-45-12.

a) Two-piece plugs or plugs with internal cavities shall NOT be acceptable.

2) The plug shall have a cylindrical seating surface eccentrically offset from the center of the shaft.

3) Valves shall be furnished with resilient elastomer faced plugs, suitable for use with wastewater.

a) Plug facing shall be composed of either EPDM or Neoprene.

b) Pug facings composed of natural rubber, Viton, or Nitrile shall NOT be acceptable.

4) Plug shall not contact the seat until at least 90% closed.

5) Spherical shaped plugs are not acceptable.

C. Bodies and covers shall be Cast Iron ASTM A126 Class B or Ductile Iron ASTM A536 Grade 65-45-12.

1) At a minimum, valves measuring 4 inches to 12 inches in diameter shall have 175 psig bodies, and valves measuring 14 inches and greater in diameter shall have 150 psig bodies.

2) Ports shall be rectangular and 100% port.

3) The valve port area shall meet or exceed standard pipe area per ASME/ANSI B36.10M. Round ports are not acceptable.

4) For specific installation locations where the Total Dynamic Head (TDH) plus the surge pressure exceeds the minimum pressure ratings above, Class 250 flat face flanged ends and a 400 psi (for 3-inch to 12-inch valves) or 300 psi (for 14-inch and greater valves) valve body shall be provided.

D. Seats

1) Valve seats shall be in accordance with AWWA C517, latest revisions.

2) Seats on the body shall be 1/8” thick welded overlay of not less than 95% pure nickel.

a) Seat shall be at least 1/2” wide, 1/8” thick through entire width and raised.

b) The raised surface shall be completely covered with nickel to insure that the resilient plug face contacts only the nickel seat.

3) Alternatively, valve seats shall be replaceable 316 stainless steel seats.

4) Seats composed of thermosetting epoxy or fusion bonded nylon shall NOT be acceptable.

5) Screwed-in seats shall NOT be acceptable.

E. Bearings

1) Radial shaft bearings shall be permanently lubricated, sleeve-type, sintered, oil-impregnated bearings:

a) Type 316 stainless steel for sizes 4-inch to 18-inch.

b) ASTM A743 Grade CF8M for sizes 20-inch to 36-inch.

c) Bronze in accordance with ASTM B-127.

d) Non-metallic radial shaft bearings shall NOT be acceptable.

2) Thrust bearings/washers shall be composed of Type 316 stainless steel, Teflon, Nylon 11, or Nylatron.

F. Shaft seal

1) Adjustable packing shall be Acrylonitrile-Butadiene (NBR) multiple V-ring type, with a packing gland follower.

2) Packing gland shall permit inspection, adjustment or complete replacement of packing without disturbing any part of the valve or actuator assembly, except the gland follower.

3) Shaft seals shall be self-adjusting.

4) Non-adjustable packing or packing requiring actuator removal to replace the packing shall not be acceptable.

5) All shaft seal hardware shall be 316 stainless steel

G. End connections shall meet or exceed the latest revisions of AWWA C517 and other applicable standards. End Connections shall be flanged drilled per ASME B16.1 for above grade valves and Mechanical Joint for buried valves per AWWA C111.

H. Interior Valve Lining

1) All interior ferrous surfaces of the plug valve that will have contact with wastewater, except the valve seating surfaces, shall be coated with a factory applied, fusion bonded or thermosetting epoxy coating in accordance with AWWA C550, latest revision.

2) Coating shall be holiday-free with a minimum thickness of twelve (12) mils DFT.

3) Surfaces shall be clean, dry and free from rust, oil and grease before coating.

I. All valves larger than 6-inch shall be installed with worm gear actuators. The actuator shaft and gear quadrant shall be supported on permanently lubricated bronze bearings.

1) Valves shall be equipped with traveling nut, self-locking type operators designed, manufactured and tested in accordance with AWWA C517.

2) All gearing shall be enclosed in a cast iron housing with outboard seals to protect the bearings and other internal components.

3) The actuator shaft and gear quadrant shall be supported on permanently lubricated bronze bearings.

J. Plug valves installed in valve vaults, except where indicated otherwise, shall have mechanical gear actuators with handwheel operators designed for submerged service.

1) Actuator shall clearly indicate valve position for above-ground and valve vault installations.

2) Actuator mounting brackets for submerged service shall be totally enclosed and shall have gasket seals.

3) All exposed valve nuts, bolts, springs, washers and the like shall be Type 316 stainless steel.

K. All buried valves shall be provided with totally enclosed worm gear actuators, 2-inch square AWWA operating nuts, extension stems and valve boxes.

1) Buried actuators shall be 90% grease filled.

2) Input shaft and fasteners shall be stainless steel.

3) Actuator mounting brackets shall be totally enclosed.

4) Buried valve operators shall be extended to within 6 inches of grade.

L. Gear actuators shall be designed to produce the required operating torque with a maximum rim pull of 80 pounds on a hand wheel and with a maximum input of 150 foot-pounds on 2-inch operating nuts.

M. Actuator shall be capable of withstanding an over-torque without damage up to three hundred (300) foot-pounds for handwheel operators, or up to four hundred and fifty (450) foot-pounds for two (2) inch nut operators.

N. Plug valves and operators shall be installed according to the manufacturer’s recommendations for conveying fluids with high solid concentrations.

1) For valves installed in a horizontal pipeline, install the valve so the plug rotates up when opened. Where drain-back does not exist, install the valve with the higher pressure, when closed, against the end opposite the seat.

2) For valves installed in a vertical pipeline, or where the possibility of overhead drain-back exists, the plug valve shall be installed so that the plug face is pointing to the side when the valve is open and the plug face is pointing upwards when the valve is closed to prevent drain-back solids from settling into the valve body.

O. Below grade plug valves shall be installed horizontally with right angle operators pointing up to allow operation from grade.

P. Above-ground valves 6 inches in diameter and smaller shall have manual lever operators, unless otherwise specified or noted on the Drawings.

Q. Above-ground valves 8 inches in diameter and larger shall be manually hand wheel operated through totally enclosed worm gear actuators, unless otherwise specified or shown on the Drawings.

R. Manual operators for plug valves mounted above 6 feet from the operating floor shall be equipped with worm gear chain wheel actuators.

S. All valves shall be provided with mechanical travel stops for the open and close positions and shall rotate 90 degrees from fully open to fully close.

T. Valves shall be either directly cast with, or provided with an attached corrosion-resistant, nameplate stating, at a minimum, the following:

1) Valve serial number

2) Manufacturer

3) Size

4) Maximum shutoff pressure

5) Design pressure rating.

U. The seat end shall be clearly indicated on the valve exterior relative to half of the body containing the plug/seat interface.

5.5.3.8 Valves shall be Dezurik, Val-Matic or approved equal.

5.5.4 Air/Vacuum Valves

5.5.4.1 Air release/vacuum valves (combination valves) are to exhaust pockets of air in the force main accumulated during operation of the pump station and to exhaust or admit air during the filling or draining of the force main.

5.5.4.2 Consideration shall be given to providing automatic air release/vacuum valves with flood protection in areas within the one hundred (100) year floodplain or any areas where flooding is anticipated to occur.

5.5.4.3 Automatic air release/vacuum valves shall be provided at all high points to prevent air locking of the force main and at locations along the force main where sub-atmospheric pressures or column separation may occur.

5.5.4.4 The route of the force main shall be such that the number of air release/vacuum valves will be minimized to the greatest extent possible.

5.5.4.5 Locations

A. At the discharge of the pump if necessitated by the piping arrangement.

B. Force mains shall have a combination air release/vacuum valve at each high point and as may be prescribed by any hydraulic transient analysis.

C. Location and sizing of combination air release/vacuum valves shall be determined by hydraulic modeling of the force main and verified by the valve manufacturer.

D. The sizing shall also take into consideration rapid draining of the force main due to a line break.

E. Force mains shall be designed to minimize the number of air release/vacuum valves required.

1) The force main bury depth may be varied up to a maximum of 10 feet where deemed necessary to eliminate air release valves.

5.5.4.6 One spare air release/vacuum valve shall be provided for every five (5) air release/vacuum valves installed.

A. If applicable, a minimum of one (1) spare valve shall be provided per force main.

5.5.4.7 All air release/vacuum valves shall be located inside a concrete manhole.

A. The manhole shall be appropriately sized for the installation and maintenance of the air release/vacuum valve.

1) Minmum manhole diameter shall be 96 inches.

B. Air release/vacuum valve manholes shall be installed such that the air valve can be worked on and removed without the need to pull the top of the manhole ~~or vault~~ off.

C. Approved air release/vacuum valve installation is provided in Standard Detail P-018, Appendix B.

D. The manhole shall be provided with a FCPW approved odor control device.

5.5.4.8 Types

A. Air/vacuum valves shall be Vent-Tech by International valve or Vent-O-Mat series RGX and shall be installed per Standard Detail and manufacturer's recommendation.

5.6 Pressure Gauge

5.6.1 Pressure gauge sizing shall take into consideration the current discharge pressure, flow ranges and future capacity of the pump station.

5.6.2 Gauge gradation shall not be more than one hundred and twenty percent (120%) of the maximum pressure anticipated at the pump station.

5.6.3 The pressure gauge tap shall have diaphragm mounted seals.

5.6.4 Pressure gauge face shall be four (4) inches minimum.

5.6.5 Pressure gauges shall be installed within the valve vault.

5.6.6 Wafer style isolation ring of the same diameter as the force main piping shall be installed to facilitate the installation of a pressure gauge.

5.6.7 The pressure gauge tap with diaphragm mounted seals shall be located on the side of each pipe in the valve vault, see Standard Detail P-014 in Appendix B for placement.

5.6.8 Pressure gauge face shall be installed facing up toward to the access hatch such that the pressure gauge shall be easily read by looking down into the valve vault.

5.6.9 The pressure gauge shall be connected to the telemetry system via the control PLC for off-site monitoring.

5.6.10 Acceptable manufacturers:

5.6.10.1 Pressure gauge manufacturer is Endress & Hauser.

5.6.10.2 Isolation ring manufacturer is Onyx.

5.7 Diaphragm Seals

5.7.1 Diaphragm seals shall be Type 316 stainless steel seals with flushing connections.

5.7.2

5.7.3 Acceptable Manufacturers:

5.7.3.1 Ametek

5.7.3.2 Ashcroft

5.7.3.3 Trerice

5.7.3.4 FCPW Approved Equal

PART 6 HOIST

6.1 Materials and Installation

6.1.1 Stationary electric hoists, “jib crane”, are the only acceptable type for pump station applications.

6.1.2 All hoists shall be of stationary type mounted on a concrete pad of sufficient size and strength suitable for the hoist and anticipated load size and weight.

6.1.2.1 An example jib crane base is provided as Standard Detail P-005.

6.1.2.2 As shown in Standard Detail P-005, number five (#5) rebar with two (2) ninety (90) degree bends shall anchor the jib crane to the concrete pad.

6.1.2.3 Dimensions shown in Standard Detail P-005 are minimum values. The pad may need to be larger and/or deeper depending on the pump weight and jib crane installed**.**

6.1.3 Electric hoist shall be weather proofed with a weather proof cover.

6.1.4 Electric hoists to include ratchet type manual crank.

6.1.5 Hoists shall be epoxy coated in a three (3) step process using Ameron Amercoat 68HS epoxy primer, Amercoat 385 epoxy, and a finish coat of Amercoat 450HS polyurethane paint.

6.1.6 Portable hoists shall not be allowed.

6.1.7 The hoist system shall be designed so that the pumps can be lifted from the wet well and placed on a platform or maintenance vehicle easily.

6.1.8 The hoist and accessories shall be rated for not less than one and one-half (1.5) times the heaviest anticipated load.

6.1.9 Acceptable hoist manufacturers

6.1.9.1 Thern.

6.1.9.2 FCPW approved equal

6.1.10 The hoist system shall be mounted next to the pumping station. Special care shall be taken to assure that the proper length and strength of hoist cable is provided.

6.1.11 Hoist shall be installed with stainless steel anchor bolts.

6.1.12 Power for the hoist shall be supplied via the pump station control panel with a dedicated circuit breaker located on the inner panel door.

6.1.13 For example hoist placement reference Standard Detail P-014 in Appendix B.

PART 7 ODOR CONTROL AND WET WELL VENTILATION

7.1 Pumping stations wet wells are hazardous areas and stringently classified under the National Fire Protection Association (NFPA), the Occupational Safety and Health Administration (OSHA) and the National Electric Code (NEC).

7.2 In general, Developer’s Engineer shall eliminate any need to enter the wet well on a routine basis.

7.3 Guidelines related to wet well ventilation and the related subject of odor control include the following:

7.3.1 To reduce odor problems caused by gas release, the fall of wastewater from the inlet sewer to the wet well water level shall be minimized to the extent practicable.

7.3.2 Because of poor ventilation and the presence of dangerous gases, wet wells are generally classified as Class I, Group D, Division 1 areas under the NEC.

7.3.2.1 Explosion proof submersible pumps and measuring devices shall be the only equipment inside the wet well.

7.3.2.2 Electrical connections in the wet well shall also be explosion proof.

7.4 Wet wells are generally rated as Class A confined spaces according to OSHA regulations. This classification requires special safety procedures for entry.

7.5 Wet wells shall be ventilated with odor control, as listed herein.

7.5.1 All air contacting wastewater within the wet well shall be treated to remove odors prior to discharging to the atmosphere.

7.5.2 The odor control system shall include neutralizing or preventing production of odorous compounds, treatment of odorous compounds, containing and treating foul air and enhancing dispersion of foul air.

7.5.3 Odor complaints from pump stations are generally caused by the release of hydrogen sulfide (H_2S) gas. Therefore, the air treatment systems are primarily designed to control H_2S.

7.6 The odor control system manufacturer shall be responsible for a complete system including carbon vessel, ductwork, dampers, mist/grease eliminator, piping, concrete pad, controls, and conduit and wiring required for the odor reduction system.

7.6.1 The odor control system shall include neutralizing or preventing production of odorous compounds. The Developer/Contractor shall provide for treatment of odorous compounds, containing and treating foul air, and enhancing dispersion of treated air.

7.6.2 The odor control system is to be an activated carbon type.

7.6.3 Media System

7.6.3.1 Recommended Activated Carbon Odor Control System Manufacturers:

A. ECS

B. Daniel

C. Purafil

D. Purair

E. FCPW approved equal

7.6.4 Substrate characteristics:

7.6.4.1 Virgin, granular gas-phase type suitable for control of sewage treatment odors, designed for high loadings of organic compounds.

7.6.4.2 Carbon substrate characteristics:

A. Mesh size distribution: 4 x 8 min.

B. Mean particle diameter: minimum 3.7 mm, ASTM D2862.

C. Uniformity coefficient: maximum 1.9 per foot at bed depth, AWWA B604.

D. Iodine number: 1000 or 1050.

E. Maximum head loss at 50 fpm velocity densed packed bed: 1.9 in wc/ft bed depth.

7.6.5 Contractor/Developer shall furnish service for one (1) year from start-up of the system and the media shall be refilled at time of acceptance at Contractor/Developer cost.

7.6.5.1 Carbon Usage Rate Test:

A. Developer shall supply FCPW a quarterly analysis of the activated carbon to be reported as "H_2S Capacity."

B. Developer shall furnish this service for one (1) year from start-up of the systems at no additional cost to FCPW.

C. The testing shall establish the carbon usage rate and the optimum replacement or regeneration procedure to be used. This information shall be presented to FCPW at the time of ownership transfer.

7.6.6 Ventilation Equipment

7.6.6.1 Pump stations shall be adequately vented in complete compliance with all applicable local and state building codes as well as OSHA and NFPA Standards.

7.6.6.2 Forced air odor control systems shall be designed for a minimum of 12 air changes per hour.

7.6.6.3 If needed, pump station wet wells shall be provided with a gooseneck-type inlet vent and damper. Active ventilation units may also be acceptable.

7.6.6.4 Vents shall be constructed of stainless steel or Schedule 80 PVC with an UV inhibitor and shall be adequately supported to withstand damage during normal and emergency operation and maintenance.

7.6.6.5 Vent elevations shall be a minimum of two feet above the one hundred- (100-) year flood elevation as identified on the most recent Federal Emergency Management Agency (FEMA) map when available or as established through appropriate modeling techniques.

7.6.6.6 Wet well suction ductwork shall be above the high water level.

7.6.6.7 Vents shall be provided with an air vent filter and insect/bird screen of fiber glass, stainless steel or aluminum. Under no circumstances shall steel or galvanized steel be used.

7.6.7 Units requiring a constant supply of water or biological treatment units shall not be acceptable.

7.7 Odor control systems shall be designed for the following capacities when wet wells are within (or are anticipated to be within) 200 feet of residential or commercial area.

7.7.1 99.5% removal of the following contaminants:

7.7.1.1 H_2S at concentrations up to 10 ppm.

7.7.1.2 Sulfur dioxide

7.7.1.3 Ammonia

7.7.1.4 Mercaptans

7.7.1.5 Aldehydes

7.7.1.6 Organic compound

7.7.2 Odor shall not be detectable beyond fence lines.

7.8 Industrial Wastewater Sampling

7.8.1 Prior to the acceptance of any industrial wastewater discharge into the FCPW collection system, a water quality report shall be submitted to FCPW.

7.8.2 A sampling point shall be provided upstream of the industrial wastewater discharge into the pumping station. It is recommended that sampling be performed at a manhole upstream of the discharge manhole.

7.8.3 Odor control requirement shall be based on longest detention time

7.9 Pump stations shall be adequately vented in complete compliance with all applicable local and state building codes as well as OSHA and NFPA Standards.

7.9.1 At a minimum, pump station wet wells shall be provided with 12 air changes per hour for standard domestic wastewater.

7.9.2 For air inlet ventilation, a vent shall extend through the concrete slab at the top of the wet well and shall connect to the odor control unit, as shown in Standards Detail P-014, Appendix B.

7.9.3 Vents shall be constructed of stainless steel or FRP and shall be adequately supported to withstand damage during normal and emergency operation and maintenance.

7.9.4 Vent elevations shall be a minimum of two feet above the 100-year flood elevation as identified on the most recent FEMA map when available or as established through appropriate modeling techniques.

7.9.5 Vents shall be provided with an insect/bird screen of stainless steel or aluminum. Under no circumstances shall steel or galvanized steel be used.

PART 8 PROTECTIVE COATINGS

8.1 Coating Systems

8.1.1 The exterior of concrete wet wells shall be coated with epoxy.

8.1.1.1 Coating shall be continuous, free of pin holes and or voids and shall be applied in accordance with manufacturer’s instructions.

8.1.1.2 After wet well top slab, base and all sections have been permanently set into place, seal outside with a chemically compatible non-shrink grout prior to exterior application of protective coating.

8.1.1.3 Non-penetrating lift holes shall be filled with non-shrink grout after installation of the sections.

8.1.1.4 Concrete surfaces shall be free from oil, curing compounds, dust, dirt and other interfering materials removed by sandblasting and shall be fully cured prior to the application of any coatings.

8.1.2 Interior surfaces of concrete wet wells shall be coated with a corrosion resistant epoxy coating before the station is accepted by the FCPW.

8.1.2.1 Prior to applying the spray liner, eight (8) inch joint wrap shall be applied to the precast section joint seams.

8.1.2.2 Surface preparation, thickness, mixing and application shall be in accordance with the manufacturer's instructions.

8.1.2.3 The coating shall be 100% solids high build epoxy coating formulated for application within a sanitary sewer environment.

8.1.2.4 The coating thickness shall be a 125 10 250 mils in one or two multi-pass coats.

8.1.2.5 The coating color shall be white or off-white.

8.1.2.6 The cured epoxy resin system shall conform to the following minimum structural standards:

	Strength (psi)
Compressive Strength (ASTM D695)	12,000
Flexural Strength (ASTM D790)	11,000
Tensile Strength (ASTM D-638)	7,000
Flexural Modulus (ASTM-790)	500,000

8.1.3 Any manhole that is downstream from the force main discharge shall be protected from corrosion.

8.1.4 Acceptable epoxy coating systems:

8.1.4.1 Perteu Coat M PLS 614

8.1.4.2 Epoxy 301-14 by Warren Environmental

8.1.4.3 CPP by Epoxytec

8.1.4.4 Approved equal.

8.1.5 Cast-in-place or pre-cast concrete may use admixtures such as Xypex Bio-San C-500 instead of an exterior coating.

PART 9 BUILDINGS

9.1 Applicability

9.1.1 Certain pump station designs may require additional structures or a wet well-dry pit design. Parts 10 through 14 and onward through the end of this Section identify the major requirements for these configurations.

9.2 General

9.2.1 The items listed here are intended as a general guide only and may not cover all requirements. It is the responsibility of the Developer's Design Engineer to apply the most stringent requirements.

PART 10 GENERAL BUILDING REQUIREMENTS

10.1 Governing Codes and Standards:

10.1.1 International Building Code with Georgia Amendments, latest edition.

10.1.2 Applicable Local Issuing Authority requirements.

PART 11 SHELTERS

11.1 Shelter shall be sized to accommodate pump station's electrical and controls equipment and to provide secure protection from the weather, vandalism and unauthorized access.

11.2 Structures shall be designed for wind and seismic requirement as determined by governing codes and standards noted in Paragraph 10.1 above.

11.3 Shelter shall be installed on a cast-in-place slab with curb.

11.4 Internal mounting flange shall be provided for anchoring the shelter to curb.

11.5 The following components and features shall be provided in addition to the standard features:

11.5.1 LED Interior and exterior entry lighting.

11.5.2 Personnel door with interior panic hardware and lock.

11.5.3 Convenience receptacles.

11.5.4 Custom color selection.

11.5.5 Built-in equipment mounting struts.

11.5.6 Thermostat controlled HVAC.

11.5.7 Double or rollup door sized to accommodate removal of installed panels.

11.6 Shelters shall be by Tracom, Inc., Warminster Fiberglass or an approved equal.

PART 12 ARCHITECTURAL DESIGN CRITERIA

12.1 Architectural Requirements for dry-pit Pump Station Building

12.1.1 Separate electrical and pump rooms are required.

12.1.2 The pump room will also include a bridge crane capable of hoisting the pumps and motors selected for the design.

12.1.2.1 Developer's Design Engineer shall be responsible for sizing crane to match final equipment selections.

12.1.3 All interior and exterior luminaires shall be LED.

12.1.4 A roll up door shall be provided for equipment removal. Personnel door(s) shall be provided for daily access. Doors shall be lockable.

12.1.5 Building security shall be provided. Intruder alarms shall be tied into SCADA.

12.1.6 The exterior will be designed to match the prevailing local architecture.

12.1.7 The roof shall be hip, sloped standing metal seamed roofing.

12.1.8 Prefinished metal gutters and downspouts are required.

12.1.9 The building will not have windows unless there are floors above ground level.

12.1.10 Interior materials shall be suitable for the intended environment.

12.2 Pre-fabricated structures

12.2.1 May be allowed depending on prevailing structural and architectural requirements.

PART 13 STRUCTURAL DESIGN CRITERIA

13.1 Pump station structures shall be designed and built in complete compliance with all applicable state, local and federal codes as well as any applicable OSHA Standards.

13.2 Governing Codes and Standards:

13.2.1	ACI 301-10	Specifications for Structural Concrete
13.2.2	ACI 318-11	Building Code Requirements for Structural Concrete
13.2.3	ACI 350- 06	Code Requirements for Environmental Engineering Concrete
13.2.4	CRSI	Manual of Standard Practice

13.3 Material Standards

13.3.1 Concrete

13.3.1.1 ASTM C150 Type I/II.

13.3.1.2 4000 psi minimum strength, unless design requires higher strength.

13.3.2 Reinforcing Bars

13.3.2.1 ASTM A615 Grade 60 deformed.

13.3.3 Waterstops

13.3.3.1 Flexible PVC CE CRD-C572.

13.4 Design Requirements

13.4.1 Construction of the pump station building shall accommodate weight of equipment to be installed, bridge crane and roof system as required for any equipment to be installed on the roof.

13.4.2 Design of concrete structures shall incorporate consideration of all external forces including but not limited to:

13.4.2.1 Dead loads.

13.4.2.2 Live loads.

13.4.2.3 Wind loads.

13.4.2.4 Seismic loads.

13.4.2.5 Lateral soil pressures.

13.4.2.6 Lateral hydrostatic pressures.

13.4.2.7 Uplift hydrostatic pressures.

13.4.2.8 Soil bearing loads.

13.4.2.9 Top slab loading.

13.4.2.10 Pipe support loading.

13.4.2.11 Equipment weights, performance loads and induced forces.

13.4.2.12 Internal piping forces such as water hammer.

13.4.2.13 Lifting of precast concrete members.

13.4.3 Dimensions of concrete structures shall be determined based on functionality and required access of housed equipment and systems.

13.4.4 Required Foundation Preparation, Allowable Soil Bearing and Lateral Soil Pressures shall be provided by a Registered Geotechnical Engineer.

13.5 Concrete

13.5.1 Concrete shall be structural concrete with a twenty-eight (28) day compressive strength of four thousand (4,000) psi.

13.5.2 Proportion concrete in accordance with the latest requirements of ACI 211.1.

13.5.3 The slump of all concrete will be maximum four (4) inches or less than 1 inch unless exceptions specifically authorized by FCPW.

13.5.4 The air content by volume of all concrete will be from three percent (3%) to six percent (6%).

13.5.5 Concrete will contain a water-reducing and retarding admixture, unless specifically exempted by FCPW.

13.5.6 Do not exceed the water-cement ratio of the design mix which includes all water added. Water-cement ratio of the design mix shall be per manufacturer's recommendation.

13.5.7 The water reducing and retarding admixture will be in accordance with the manufacturer's requirements.

13.6 Pump Station Pad

13.6.1 Size

13.6.1.1 A minimum six (6) inch thick, forty-five (45) feet by forty-five (45) feet concrete pad shall be installed.

13.6.2 Material and Installation

13.6.2.1 The pavement design shall consider loading exerted by an eighty thousand (80,000) pound tanker truck.

13.6.2.2 Pump station pad shall be, at a minimum, reinforced with Number 5 (#5) rebar spaced twelve (12) inches on center on both the top and bottom faces and in each way as well, i.e. longitudinal and transverse. Expansion joints shall be installed as needed in the pump station pad.

13.6.3 A concrete curb shall be constructed underground around the pumping station, as shown in Standard Detail P-008 in Appendix B.

13.6.4 Asphalt will not be acceptable for the pad.

13.6.5 The pump station pad shall be constructed on a six-inch layer of compacted aggregate base course stone over a prepared subgrade.

13.6.6 Pump station subgrade shall be constructed on earth fill of select material.

13.6.7 Select backfill material shall consist of finely divided earth, stone, dust, sand, crushed stone or other approved material free from all wood, vegetable matter, debris and other objectionable material and having scattered clods, stone or broken concrete less than two (2) inches in maximum dimension.

13.6.8 The pump station concrete pad shall be installed with a 0.5% slope from the center of the pad to the edge of the pad.

13.6.9 The pump station concrete pad shall be concaved and sloped away from the station to divert the storm water away from the station and toward a storm drain.

13.6.10 Concrete must extend six (6) inches past the station fenced perimeter all the way around.

13.6.11 Additionally, the installation of a flume or stormwater piping (perforated pipe wrapped in filter fabric) to divert stormwater from the pad to a stormwater pond may be required by FCPW.

13.6.12 The fill shall be placed in layers of not more than six inches compacted thickness and compacted by the use of heavy rolling or power tamping equipment to secure at least ninety-five percent (95%) of the Standard Proctor Dry Density.

13.6.13 Backfills around structures shall be properly placed and compacted.

13.6.13.1 The fills shall be brought up in layers.

13.6.13.2 The layers shall be thoroughly compacted to at least ninety-five percent (95%) of the Standard Proctor Dry Density,

13.6.13.3 Each layer to be not deeper than six inches compacted thickness.

13.6.13.4 Compaction around structures shall be by use of heavy power tamping equipment.

PART 14 MECHANICAL DESIGN CRITERIA

14.1 Governing Codes and Standards:

14.1.1 Referenced codes and standards shall refer the latest approved edition.

14.1.2 International Mechanical Code with Georgia Amendments.

14.1.3 International Plumbing Code with Georgia Amendments.

14.1.4 National Fire Protection Association (NFPA) standards.

14.1.5 American Society of Heating, Refrigeration, and Air-conditioning Engineers (ASHRAE) standards.

14.1.6 American Society for Testing and Materials (ASTM).

14.1.7 Underwriter Laboratories – UL Listing and Label

14.2 Mechanical Scope of Work:

14.2.1 Provide ventilation system for the Pump Room.

14.2.1.1 The ventilation system shall be sized to account for heat gain in the space including the heat generated from equipment running continuously at full load.

14.2.1.2 The ventilation system intake and exhaust shall be located such that the air will sweep thru the entire room and there will be no short-circuiting of airflow.

14.2.1.3 Intake and exhaust wall louvers shall be sound attenuating.

14.2.1.4 All ductwork and louvers, shall be of aluminum construction.

14.2.2 Provide hose-down corrosion resistant type electric unit heater(s) rated for appropriate area classification.

14.2.2.1 Unit heaters shall be provided with integral thermostat to maintain the space above 50° F in the winter.

14.2.3 The Electrical Room shall be provided with air conditioning units to cool the space to within acceptable limits as determined by the installed gear.

14.2.3.1 The cooling system shall be N+1 with each unit sized for 100% of the total cooling load in the space including heat gain from VFDs and other electrical gear.

14.2.3.2 The cooling units serving the Electrical Room shall be provided with smoke detection and remote reporting of smoke alarm condition.

14.2.4 The Electrical Room shall be provided with a separate room temperature sensor and a remote high temperature alarm shall be activated in the event of high space temperature (adjustable).

14.2.5 Provide the services of an independent testing and balancing company certified by National Environmental Balancing Bureau (NEBB) or Associated Air Balance Council (AABC) to perform testing and balancing of HVAC systems.

14.2.6 The pump station shall be provided with reduced pressure zone type backflow preventer, floor drains, and indoor and outdoor non-freeze type hose bibbs for wash-down.

14.2.7 All above ground (interior) potable piping shall be ASTM B88, Type L hard drawn copper.

14.2.7.1 The pipe fittings shall be soldered copper or bronze, and the pipe joints shall be brazed.

14.2.8 The Pump Room shall be provided with sump pump(s) to which all water in the Pump Room will drain.

14.2.8.1 Power supply and control equipment for the sump pumps shall be installed in the Electrical Room.

PART 15 SURVEY STANDARD

15.1 As-builts for all water and wastewater projects shall include all new and existing infrastructures directly adjacent to the project area.

15.1.1 This includes, but not limited to, fire hydrants, water valves, water mains, water meters, tees, tap sleeves, bends, reducers, and plugs.

15.1.2 Sewer infrastructure shall include manholes, sewer mains, force mains, air valves, cleanouts and all features in and around sanitary sewer lift stations.

15.2 The primary survey strategy will implement a GPS methodology.

15.2.1 Developer's consultant shall use the Real Time Kinematic Method (RTK) or Rapid Static Method (RSM) and equipment adequate to produce horizontal, vertical, and elevation coordinates (x, y, and z) which shall be consistent with FCPW methods (centimeter survey grade accuracy).

15.2.2 If it's determined that a number of features cannot be located directly by GPS due to obstructions, a secondary survey shall be employed to capture obscured points.

15.2.2.1 The secondary strategy should consist of surveying using conventional methods. Establishing a transit and back sight using GPS, establishing a traverse loop, maintaining a minimum of 1:10,000 closure for the traverse, and side shots being collected by occupying the traverse points.

15.2.2.2 Side shots should be enough to adequately survey the required features and/or other relevant features.

15.2.3 After data collection is complete, standard survey procedure dictates that the files will be downloaded into a coordinate geometry (COGO) package for any translation or rotation that might be required.

15.2.4 The specifications for the datum and coordinate will be the Georgia West State Plane coordinate system.

15.2.4.1 The horizontal datum will be the North American Datum (NAD83).

15.2.4.2 The vertical datum will be the North American Vertical Datum (NAVD88).

PART 16 LIFTING EQUIPMENT

16.1 Each pump station of any configuration shall be supplied with lifting systems capable of moving each pump to and from the installed position to a service vehicle parked on the pump station property.

16.2 All hoists shall be motorized.

16.3 The hoist shall be rated for 150 percent of the heaviest load anticipated.

16.4 Cranes shall comply with the requirements of the following:

16.4.1 OSHA

16.4.2 The Crane Manufacturer's Association of America (CMAA) Standards

16.4.3 The Hoist Manufacturer's Institute (HMI) Standards

16.4.4 ANSI/ASME HST-4 Performance Standard for Electric Wire Rope Hoists

16.4.5 Other relevant standards applicable for the selected lifting mechanism.

PART 17 SPARE PARTS AND ACCESSORIES

17.1 All submersible wastewater pumping stations shall be furnished with the following spare parts and accessories:

17.1.1 Each – Factory operation and maintenance manuals

17.1.2 Each – Programming Key for Transfer Switch

17.1.3 Each – Pressure Transducer

17.1.4 Each – Sets of keys to the pump station and all lockable doors, cabinets or fixtures.

17.1.5 Each – Valve key to operate the valves

17.1.6 Each – Eight foot fiberglass ladder.

SECTION 4

WASTEWATER PUMPS

PART 1 SUMMARY

1.1 This section specifies centrifugal submersible pumps suitable for pumping solids-bearing liquids (wastewater) at variable speed.

1.2 For proposed pumps that are not from a pre-approved manufacturer’s standard offering, or that are custom-engineered pumps, additional design and Quality Assurance Requirements may be required.

1.3 Pumps will be installed in either a wet-pit or dry-pit configuration as specified.

1.3.1 Pumping units for wet-pit configurations shall be complete with motor, cables, protection devices, discharge fitting/elbow, guide bars and brackets, chain and cable hooks and other accessories as necessary.

1.3.2 Pumping units for dry-pit configurations shall be submersible type and complete with motor, cables, protection devices, inlet elbow, integral cooling system, supports/pedestal and mounting plates and other accessories as necessary.

1.4 Pump manufacturer shall provide the following documentation:

1.4.1 Design for the pump baseplate/frame and anchorage including anchor bolts.

1.4.2 Drawings showing the following:

1.4.2.1 Dimensions and size of pumps, motors, drives and specified appurtenances.

1.4.2.2 Piping connections.

1.4.2.3 Construction details of equipment (including bearings and bearing isolators).

1.4.2.4 Wiring diagrams.

1.4.2.5 Weights.

1.4.3 Manufacturer's data including materials of construction and equipment weight.

1.4.4 Proof of service of previously installed units of similar size, rating and configuration.

PART 2 REFERENCES

2.1 The following list of references are included as part of this document.

Reference	Title
ABMA 9	Load Ratings and Fatigue Life for Ball Bearings
ABMA 11	Load Ratings and Fatigue Life for Roller Bearings
AISC	American Institute of Steel Construction—Manual of Practice
ANSI/API 610	Centrifugal Pumps for Petroleum, Petrochemical and Natural Gas Industries (also referenced as ISO 13709-2009)
ANSI/ASME B46.1	Surface Texture, Surface Roughness, Waviness and Lay
ANSI/HI 1.1–1.6	Rotodynamic (Centrifugal) Pumps
ANSI/HI 2.1–2.4	Rotodynamic (Vertical) Pumps
ANSI/HI 9.1–9.5	Pumps – General Guidelines for Types, Applications, Definitions, Sound Measurements and Documentation
ANSI/HI 9.6.1	Rotodynamic Pumps—Guideline for NPSH Margin
ANSI/HI 9.6.2	Centrifugal and Vertical Pumps for Allowable Nozzle Loads
ANSI/HI 9.6.3	Rotodynamic Pumps (Centrifugal and Vertical) Guideline for Allowable Operating Region
ANSI/HI 9.6.4	Rotodynamic Pumps—Vibration Measurements and Allowable Values
ANSI/HI 9.6.6	Rotodynamic Pumps for Pump Piping
ANSI/HI 9.6.8	Rotodynamic Pumps—Guideline for Dynamics of Pumping Machinery
ANSI/HI 9.8	Pump Intake Design
ANSI/HI 11.6	Submersible Pump Tests
ANSI/HI 14.6	Rotodynamic Pumps for Hydraulic Performance Acceptance Tests
API 686/PIP REIE 686	Recommended Practices for Machinery Installation and Installation Design
ASME B18.8.2	Taper Pins, Dowel Pins, Straight Pins, Grooved Pins, and Spring Pins (Inch Series)
ASME Code	ASME Boiler and Pressure Vessel Code
ASTM A27	Steel Castings, Carbon, for General Application
ASTM A36	Carbon Structural Steel
ASTM A148	Steel Castings, High Strength, for Structural Purposes
ASTM A322	Steel Bars, Alloy, Standard Grades
ASTM A564	Hot-Rolled and Cold-Finished Age-Hardening Stainless Steel Bars and Shapes

Reference	Title
ASTM A571	Austenitic Ductile Iron Castings for Pressure-Containing Parts Suitable for Low-Temperature Service
ASTM A995	Standard Specification for Castings, Austenitic-Ferritic (Duplex) Stainless Steel, for Pressure-Containing Parts, Grades 2A, 3A, or 6A
ASTM B148	Aluminum-Bronze Sand Castings
AWWA C213	Fusion-Bonded Epoxy Coating for the Interior and Exterior of Steel Water Pipelines
AWWA C550	Protective Epoxy Coatings for Valves and Hydrants
NSF/ANSI 61	Drinking Water System Components – Health Effects
IEC 61298-2	Process Measurement and Control Devices. General Methods and Procedures for Evaluating Performance Tests Under Reference Conditions
ISO 1940-1:2003	Mechanical Vibration—Balance quality requirements for rotors in a constant (rigid) state—Part 1: Specification and verification of balance tolerances
ISO 9001	Quality Management Systems—Requirements, 3rd Edition (2000)
ISO 10816-1	Mechanical Vibration—Evaluation of Machine Vibration by Measurement on Non-rotating Parts—Part 1: General Guidelines, Annex B, Table B.1. Class I, II or II, as applicable. For the purposes of this specification, Annex B of ISO 10816, Part 1 forms a part of this specification and ISO 10816, Part 1.
ISO 10816-3	Mechanical Vibration—Evaluation of Machine Vibration by Measurement on Non-rotating Parts—Part 3: Industrial machines with nominal power above 15 kW and nominal speeds between 120 r/min and 15000 r/min when measured in situ, Annex A, Table A.1 and A.2. For the purposes of this specification, Annex A of ISO 10816, Part 3 forms a part of this specification and ISO 10816, Part 3.
ISO 10816-6	Mechanical Vibration—Evaluation of Machine Vibration by Measurement on Non-rotating Parts—Part 6: Reciprocating machines with power ratings above 100 kW, Annex A, Table A.1, machine vibration classification number 3. For the purposes of this specification, Annex A of ISO 10816, Part 6 forms a part of this specification and ISO 10816, Part 6.

Reference	Title
ISO 10816-7	Mechanical Vibration—Evaluation of Machine Vibration by Measurement on Non-rotating Parts—Part 7: Rotordynamic Pumps for Industrial Applications, Including Measurements on Rotating Shafts, Annex A, Tables A-1 and A-2 Category II as applicable. For the purposes of this specification, Annex A of ISO 10816, Part 7 forms a part of this specification and ISO 10816, Part 7.
MIL STD 167-2	Mechanical Vibrations of Shipboard Equipment (Reciprocating Machinery and Propulsion System and Shafting)

PART 3 GENERAL

3.1 Pump stations conveying residential, commercial, institutional, or industrial wastewater shall be provided with pumps that are suitable for continuous duty in conveying raw, unscreened solids-bearing wastewater.

3.2 Furnish and install a minimum of two (2) heavy-duty submersible wastewater pumps as specified in Section 3, Paragraph 2.6.

3.3 All pumps shall be identical within each pump station facility.

3.4 A demonstration that the submersible pumps can be removed and installed in the wet well using a powered hoist and crane and without special equipment or manipulation shall be performed at startup.

3.5 Pump(s) shall be designed for easy removal and reinstallation without the need for the removal of bolts, nuts or other fasteners.

3.5.1 The pump(s) shall automatically and firmly connect to the discharge connection, guided by no less than two parallel, non-load bearing guide rails extending from the top of the pump station to the wet well mounted discharge connection.

3.6 Pump(s) shall be heavy-duty, electric submersible, non-clog units specifically designed for pumping solids-bearing liquids and shall be fully guaranteed for this use.

3.6.1 Chopper or screw type pumps shall be considered preferable and shall be the type used unless determined inadequate for the application.

3.6.2 In such case, FCPW shall be consulted for pump selection.

3.7 Pump(s) shall be designed for continuous or cyclic operation under submerged, partially submerged or totally dry condition without damage to the pump or motor.

3.8 Each pump shall be driven by a single variable speed drive or soft start. The pump vendor shall provide confirmation on the suitability for use of the proposed drive selection.

3.9 Maximum speed of 1,800 RPM unless approved otherwise.

3.10 The pump shall be capable to operate without any limitation between 70% and 115% of the Best Efficiency Point for capacity (B.E.C) of the performance curve.

PART 4 PERFORMANCE & DESIGN CRITERIA (Pump station designer shall modify this section)

4.1 Service Conditions

Equipment number	PUMP 1	PUMP 2	PUMP N	
Area exposure	Submerged	Submerged	Submerged	
Fluid type	Wastewater	Wastewater	Wastewater	
Area Classification	C1, D1 Group D	C1, D1 Group D	C1, D1 Group D	
Fluid temperature	40 °F to 80 °F	40 °F to 80 °F	40 °F to 80 °F	

4.2 Design Requirements

Design Requirements			
Equipment number	**Value**	**Units**	**Note**
SMALLEST SIZE rigid sphere diameter, capable of passing through the pump from inlet to discharge	6	Inches	
Minimum efficiency at best efficiency point (BEP) at maximum speed		%	1
Piping connection size, minimum			
Pump inlet	6	Inches	
Pump discharge	6	Inches	
Operating speed, maximum	1,800	rpm	
Operating speed, constant or variable	Variable		
Approximate pump suction centerline elevation, NAVD 88		feet	

Design Requirements			
Equipment number	**Value**	**Units**	**Note**
Maximum expected surge pressure		feet	
Motor			
Horsepower		HP	
Type	Submersible, explosion proof		
Inverter duty	Yes		
Space heater			
Over temperature protection	Yes		
Moisture sensors	Yes		
Operating speed, maximum	1,800	rpm	
Voltage/Phase	480 VAC/ 3 Phase		

Notes:

1. The minimum acceptable efficiency at best efficiency point (BEP) at the speed required to achieve the performance specified under Condition Points A and B. The minimum acceptable efficiency is not necessarily required to be associated with any operating condition specified in paragraph Operating Conditions

4.3 Operating Conditions.

4.3.1 The operating conditions in the table below are intended to describe the results of hydraulic conditions of the pump station. Developer's Design Engineer shall determine the values in the table for pump selection.

4.3.2 Equipment furnished under this section shall be fully suitable for continuous operation at any specified condition or any condition lying between the extremes of the operating conditions specified.

4.3.3

Pump Performance at Operating Conditions				
Operating Condition			**Value**	
A	Note 1, 5	Capacity		gpm
		Total System Head		feet
		NPSHA		feet
		Duty Point Location		

Pump Performance at Operating Conditions			
B	Note 2, 5	Capacity	gpm
		Total System Head	feet
		NPSHA	feet
		Duty Point Location	
C	Note 3, 5	Capacity	gpm
		Total System Head	feet
		NPSHA	feet
		Duty Point Location	
D	Note 4, 5	Capacity	gpm
		Total System Head	feet
		NPSHA	feet
		Duty Point Location	

Pump Performance at Operating Conditions Table Notes.

1. **Condition A** shall be taken as the rated operating condition. Performance at the rated condition shall be guaranteed. Condition A has been selected to obtain the rated pumping capacity for the installation. It is not intended that the pumps be selected for maximum efficiency at Condition A. Pumps furnished under this section shall be selected to achieve Condition A performance, and also shall operate continuously without objectionable vibration or cavitation at the head specified under Condition B. Condition A may be located in the Allowable Operating Region as established by the pump manufacturer in accordance with ANSI/HI 9.6.3 and published in the manufacturer's published application data for the specific model proposed for this application. For constant speed pumps, this condition shall be the pump's full speed operating duty point.
2. **Condition B** head indicates operating conditions when the pump is operating at maximum speed against minimum anticipated system head, assuming a hypothetical head-capacity curve. Condition B shall be used for pump selection. Condition B shall be located within the Preferred Operating Region as established by the pump manufacturer in accordance with ANSI/HI 9.6.3 and listed in the manufacturer's published application data for the specific model proposed for this application. Condition B shall be located to the right of BEPQ and shall be not less than (80) percent of BEPQ. Pumps with head-capacity curves steeper than that assumed will produce somewhat less flow at somewhat lower head. The reverse will occur with pumps having a shallower head-capacity curve. Proposed pump

selections meeting this discharge head requirement by operating the equipment at less than full speed will be rejected. NPSHA, as listed for Condition B is calculated on a pumped flow of [TBD] gpm.

3. **Condition C** is the anticipated continuous duty minimum speed condition. Pumps furnished under this specification shall be capable of sustained (24 hours per day) operation at this condition. Condition C shall be located within the Preferred Operating Region as established by the pump manufacturer in accordance with ANSI/HI 9.6.3 and listed in the manufacturer's published application data for the specific model proposed for this application.

4. **Condition D** represents the expected momentary (startup/shutdown) condition. The maximum anticipated number of service cycles is x per day.

5. Total head in the above tabulation is the algebraic difference between the discharge head and suction head as defined in ANSI/HI 1.1 – 1.6. Net positive suction head available (NPSHA) in the above tabulation is referred to the pump inlet piping at centerline elevation as shown and is calculated in accordance with ANSI/HI 1.3 for average barometric pressure and maximum temperature conditions. NPSHA at the pump impeller eye can be determined by adjusting the given value by proposed pump dimensions and the indicated requirements for pump installation details. An allowance of five feet has been included for the presence of volatile constituents in the pumped fluid.

6. Maximum expected surge pressure is to be as determined by the Design Engineer's analysis.

PART 5 SYSTEM OPERATION

5.1 The pumps shall be installed in wet or dry-pit configurations as shown on the Drawings with sufficient space for access to install and remove the equipment.

5.2 The pumps shall be operated at variable speed responding to a control system that will vary the speed and number of the pumps to maintain a level set point in the wetwell.

5.2.1 Pumps shall cycle on and off at minimum operational speed during low flow periods.

5.2.2 Pumps shall alternate duty status.

5.2.3 Additional information in the control strategies are listed in the Instrumentation and Control Guidelines. Refer to Details P-024, P-026 and P-028.

5.3 The control systems shall incorporate minimum speed settings for the pumps to maintain normal pump operation within the respective pump's Preferred Operating Region (per ANSI/HI 9.6.3) to the maximum extent possible.

5.3.1 Developer shall coordinate the minimum speed settings with FCPW and pump manufacturer during the submittal review phase and finalize the same in the field during start-up.

5.3.2 Pump manufacturer shall coordinate pump and motor operational and starting characteristics with variable speed drive settings used for control of this equipment.

5.3.3 Include the following with the System Curve to be developed by Developer's Engineer:

5.3.3.1 Motor minimum operational speed

5.3.3.2 Motor maximum operational speed

5.3.3.3 Motor ramp-up and ramp-down speed, voltage, and hertz requirements

PART 6 CONSTRUCTION

6.1 Typical is listed here which may vary from manufacturer to manufacturer.

6.2 The features and materials specified herein are typically considered acceptable but may not preclude certain pumps from being considered.

6.3 General:

6.3.1 Pump suction and discharge openings shall be no less than six (6) inches.

6.3.2 Staying within the design parameters, the pump selection shall be the largest pump with minimum diameter impeller to allow for future growth.

6.3.2.1 Motor horsepower shall be non-overloading for a maximum diameter impeller.

6.3.3 Developer shall store, rotate and handle pumps according to manufacturer's recommendations.

6.3.4 Pumps shall be mounted in the wet well as shown in the Standard Detail P-014, Appendix B.

6.3.5 Pumps shall be readily removable and replaceable without dewatering the wet well or disconnecting any piping in the wet well. Each pump shall have a lifting chain.

6.3.6 Base elbow shall be anchored to the wet well floor with stainless steel "J" bolts set six (6) inches into concrete. "J" bolts shall be hooked under reinforcing steel.

6.3.7 Each submersible pump shall be supplied with one (1) lifting system. The system shall be appropriately sized for the weight of the pump to be lifted.

6.3.8 The pumps shall automatically connect to discharge elbows when lowered into place on a duel Type 316 stainless steel two (2) inch guide rail system requiring no bolts, nuts, or fasteners to affect proper sealing.

6.3.8.1 The guide bars shall not support any portion of the weight of the pumps.

6.3.9 Upper and intermediate guide rail supports shall be Type 316 stainless steel. The pump manufacturer shall submit the recommended locations of the guide rail supports to FCPW.

6.3.10 A minimum of one cable holder for each cable shall be provided. Cable holder shall be Type 316 stainless steel.

6.3.11 Mating of the pump discharge flange and base elbow face shall be accomplished by a simple linear downward motion and utilize smooth metal to metal surface contact.

6.3.12 No portion of the pump shall bear directly on the floor of the wet well and no rotary motion of the pump shall be required for sealing.

6.3.12.1 Minimum of six (6) inches concrete shall be poured in bottom of the wet well after centerline of access cover is determined.

6.3.12.2 Reinforcing steel shall be placed as required by Developer’s Design Engineer and approved by FCPW.

6.3.12.3 Precast polymer concrete wet wells shall follow manufacturer’s requirements.

6.3.12.4 Reinforcing steel to be placed as indicated in the Standard Detail P-014, Appendix B.

6.3.13 Sufficient submergence of the pump shall be provided to prevent the occurrence of vortexing within the wet well.

6.3.13.1 In no case shall the all pumps-off activation level be less than the minimum level required for successful pump operation as recommended by the pump manufacturer.

6.4 Pump Body and Accessories

6.4.1 Motor and rotating parts shall be removable from the motor end of the pump.

6.4.2 Pump/Motor mating surfaces, where watertight sealing is critical, shall be machined and fitted with Viton rubber O-rings.

6.4.2.1 Joint sealing shall be the result of controlled compression of rubber O-rings in two planes and O-ring contact of four sides without the requirement of a specific torque limit.

6.4.2.2 Rectangular cross-sectioned rubber, paper or synthetic gaskets that require specific torque limits to achieve compression shall not be considered equal.

6.4.2.3 No secondary sealing compounds, elliptical O-rings, grease or other devices shall be used

6.4.3 The pump shall be listed by Factory Mutual or Underwriters Laboratory as conforming in all respects to the requirements in UL 1207.

6.4.4 Any materials specified here are considered acceptable for the purposes of durability, strength and resistance to erosion and corrosion.

6.4.4.1 Alternative materials may be proposed for the purpose of providing greater strength or to meet required stress limitations. However, alternative materials must provide at least the same qualities as those specified for the purpose.

6.4.5 Major pump components (pump casing, impeller, intermediate housing, motor housing) shall be minimum ASTM A-48, Class 30 or 35, cast iron with smooth surfaces devoid of blow holes or other casting irregularities.

6.4.6 The lifting handle and all exposed nuts or bolts shall be Type 304 or 316 stainless steel.

6.4.7 All metal surfaces, other than stainless steel, coming into contact with the pumped media shall be protected by a factory applied epoxy coating guaranteed to protect the pump’s materials from the pumped media.

6.4.7.1 The coating shall consist of two (2) coats, eight (8) to fifteen (15) mils thick, with total minimum DFT of 20 mils with a cured hardness of 90D in accordance with ASTM D2240.

6.4.7.2 The epoxy shall be one hundred (100) percent solids by volume.

6.5 Casing:

6.5.1 One-piece casting specifically designed to bear the loads associated with removal and placement of the pump when submerged or exposed and to withstand the pressures imposed by the pump operation.

6.5.2 For submersible pumps, the entire weight of the pump/motor unit shall be supported by the pump discharge elbow. No portion of the pump/motor unit shall bear on the sump floor directly or on a sump floor mounted stand.

6.5.3 Shall have clear passageways designed to pass minimum solids size for that size class of pump unless specified otherwise.

6.5.4 The cutwater shall be specifically designed for use in fluids with stringy solids and rags.

6.5.5 The discharge nozzle shall be not less than the diameter specified in this Section and shall be reinforced for the loads imposed by the specified conditions of service.

6.5.6 The nozzle flange face shall be designed to mate with the discharge fitting specified in this Section.

6.5.7 Sealing of the pumping unit to the discharge connection shall be accomplished by a machined watertight contact.

6.6 Shaft:

6.6.1 Pump and motor shaft shall be a solid, continuous shaft.

6.6.2 The pump shaft shall be an extension of the motor shaft. The impeller shall be mounted on the motor shaft. Couplings shall not be acceptable.

6.6.3 The pump shaft shall be made of Type 416 or Type 420 stainless steel or ASTM A576 Cr 1040 with Type 420 stainless steel.

6.6.4 The pump shaft shall be turned, ground, polished and of proportions suitable for use in the specified application and shall be completely isolated from the pumped liquid.

6.7 Bearings:

6.7.1 The pump shaft shall rotate on two (2) bearings.

6.7.1.1 Motor bearings shall be anti-friction, double-shielded and factory sealed and permanently grease lubricated with high temperature grease and be capable of being regreased.

6.7.1.2 The upper bearing shall be a single row roller bearing.

6.7.1.3 The lower bearing shall be a double-row angular contact bearing to compensate for axial thrust and radial forces.

A. Single row lower bearings are not acceptable.

6.7.2 The minimum B-10 bearing life shall be one hundred thousand (100,000) hours at any point along the usable portion of the pump curve at maximum product speed.

6.8 Impeller:

6.8.1 Impeller(s) shall be minimum ASTM A-48, Class 30 cast iron, dynamically balanced, multi-vane, semi-open, back-swept non-clog design having long through-lets without acute turns.

6.8.2 Impeller(s) shall be capable of handling solids, fibrous materials, heavy sludge and other matter found in wastewater.

6.8.3 Impeller(s) shall be keyed to the shaft, retained with an expansion ring

6.8.4 The impeller shall be capable of passing a minimum 6-inch diameter solid.

6.8.5 The impeller to volute clearance shall be readily adjustable.

6.8.6 The manufacturer shall guarantee clog-free operation.

6.9 Wear Rings/Suction Covers

6.9.1 Suction Covers

6.9.1.1 A replaceable cast iron suction cover shall be used to provide efficient sealing between the volute and suction inlet of the impeller.

6.9.1.2 The suction cover shall be designed such that it may be adjusted to maintain working clearances and hydraulic efficiencies.

6.9.2 Wearings

6.9.2.1 Wear rings in pumps shall be constructed of hardened Type 400 stainless steel with minimum Brinnell Hardness Number (BHN) of three hundred (300).

6.9.2.2 The pump shall have a stainless steel impeller wear ring heat-shrink fitted onto the suction inlet of the impeller.

6.10 Mechanical Seals:

6.10.1 Each pump shall be provided with a tandem double mechanical shaft seal system consisting of two (2) totally independent lapped face seal assemblies.

6.10.2 Each seal shall consist of one stationary and one positively driven rotating corrosion resistant tungsten-carbide or silicon-carbide ring.

6.10.3 The lower, primary seal unit, shall be located between the pump and the lubricant chamber.

6.10.4 The upper, secondary seal unit, shall be located between the pump and the lubricant chamber and the motor.

6.10.5 Each seal interface shall be held in contact by its own spring system.

6.10.6 The seals shall operate in a lubricant reservoir that hydrodynamically lubricates the lapped seal faces at a constant rate.

6.10.7 The seals shall be easily replaceable.

6.10.8 The seals shall require neither maintenance nor adjustment and shall be capable of operating in either clockwise or counterclockwise direction of rotation without damage or loss of seal.

6.10.9 The following seal types shall not be considered acceptable nor equal to the dual independent seal specified:

6.10.9.1 Shaft seals without positively driven rotating members.

6.10.9.2 Conventional double mechanical seals containing either a common single or double spring acting between the upper and lower seal faces.

6.10.9.3 Ceramic seals.

6.10.9.4 Seals requiring regular maintenance or adjustment.

6.10.9.5 Seals requiring constant differential pressure to effect sealing.

6.10.9.6 Seals subject to opening and penetration by pumping forces.

6.10.10 Seal lubricant shall be FDA approved non-toxic.

6.10.11 The seal system shall not rely upon the pumped media for lubrication.

6.10.12 The motor shall be able to operate continuously while non-submerged without damage while pumping under load.

6.10.13 The pump shall be capable of continuous submergence without loss of watertight integrity to a depth of 65 feet.

6.10.14 The mechanical seal shall accommodate the manufacturer's shaft deflection at the seal face and shaft angularity with a safety factor of 3.

6.10.15 Seal lubricant chamber.

6.10.15.1 Each pump shall be provided with a lubricant chamber for the shaft sealing system.

6.10.15.2 Designed to prevent overfilling and to assure that an air pocket is provided in the seal lubricant chamber to absorb the expansion of the seal lubricant due to temperature variations.

6.10.15.3 The seal lubricant chamber shall have drain and inspection plug with positive anti-leak seal and shall be easily accessible from the outside.

6.10.16 Should both seals fail and allow fluid to enter the stator housing, a port shall be provided to direct that fluid immediately to the stator float switch to shut down the pump and activate an alarm. Any intrusion of fluid shall not come in contact with the lower bearings.

6.11 Motor

6.11.1 Variable Frequency Drives (VFD) shall be used for pumps twenty (20) horsepower and greater.

6.11.2 The motor and the pump shall be provided by the same manufacturer.

6.11.3 The pump motor shall be shall be submitted for approval by FCPW.

6.11.3.1 A performance chart shall be provided showing curves for torque, current, power factor, input/output kW and efficiency. This chart shall also include data on starting and no-load characteristics.

6.11.3.2 Pump motors shall be accompanied by a material certification specifying the hardness of wearable parts from the manufacturer.

6.11.3.3 Motor shall be installed with the pump casing at the pump manufacturing facility.

6.11.4 Pump motors shall be approved as explosion proof conforming to FM explosion proof Class 1, Division 1, Group D environments.

6.11.5 Pump motor shall be constructed in an ISO 9001 approved facility.

6.11.6 Motors shall be 60 Hertz, three phase.

6.11.6.1 Acceptable motor voltages are

A. 480V for any size motor

B. 240V/208V for motors up to 25 HP only if 480V utility service is not available.

6.11.7 Motor shall be of squirrel-cage induction, shell type design, housed in an air-filled or oil-filled watertight chamber.

6.11.8 NEMA B type Inverter Duty (NEMA MG1 Part 31) with a service factor based upon nameplate rating as follows:

6.11.8.1 The combined service factor (combined effect of voltage, frequency and specific gravity) shall be a minimum of 1.15.

6.11.8.2 The motor shall have a voltage tolerance of plus or minus ten percent (10%).

6.11.9 The motor shall be designed for operation up to 40°C (104°F) ambient and with a temperature rise not to exceed 80°C (176°F).

6.11.10 The stator winding and stator leads shall be insulated with moisture resistant Class H insulation and shall be rated at a temperature of 180°C.

6.11.10.1 The stator shall be insulated by the tickle impregnation method using Class H monomer-free polyester resin resulting in a winding fill factor of at least ninety-five percent (95%).

6.11.11 The stator shall be heat-shrink fitted into the cast iron stator housing.

6.11.11.1 The use of multiple step dip and bake-type stator insulation process is not acceptable.

6.11.11.2 The use of bolts, pins or other fastening devices requiring penetration of the stator housing is not acceptable.

6.11.12 Temperature rise not to exceed NEMA MG-1 requirements for Class B insulating materials when operating continuously under load.

6.11.13 Motors shall be Factory Mutual or UL listed in accordance with UL 674 and 1207 for the area classification indicated in Paragraph 6.10.4.

6.11.14 The motor shall be specifically designed for submersible pump usage and for continuous duty pumping media of up to one hundred four degrees (104°) Fahrenheit with an even one hundred seventy six (176°) degrees Fahrenheit temperature rise.

6.11.15 The rotor bars and short circuit rings shall be made of cast aluminum.

6.11.16 Wire nuts or crimping-type connectors shall not be used.

6.11.17 Capable of sustaining a minimum of 30 starts per hour when operated with variable frequency motor controllers.

6.11.18 The motor and cable shall be capable of continuous submergence underwater without loss of watertight integrity to a depth of 65 feet.

6.11.19 Submersible power cable shall be of adequate length to accommodate the pumping system installation as shown on the Drawings, sized according to NEC and ICEA standards, P-MSHA approved.

6.11.20 The motor horsepower shall be adequate so that the pump is non-overloading throughout the entire pump performance curve from shut-off through run-out.

6.11.21 Soft Starters are required for pumps less than twenty (20) horsepower.

6.11.22 Cooling System:

6.11.22.1 The motor shall be provided with an integral closed-loop motor cooling system using a food-grade oil, glycol or glycol and water mixture or equivalent fluid as the cooling liquid.

6.11.22.2 A stainless steel cooling jacket shall encircle the stator housing, providing for dissipation of motor heat regardless of whether the motor unit is submerged in the pumped media or surrounded by air.

6.11.22.3 An impeller, integral to the cooling system and driven by the pump shaft, shall provide the necessary circulation of the cooling liquid through the jacket.

6.11.22.4 The cooling liquid shall pass about the stator housing in a closed loop system in turbulent flow providing for heat transfer.

6.11.22.5 The cooling system shall have one fill port and one drain port integral to the cooling jacket.

6.11.22.6 Fans, blowers or auxiliary cooling systems that are mounted external to the pump motor are not acceptable.

6.11.22.7 Pump motors which are cooled by circulating pumped sewage within the motor housing are not acceptable.

6.11.22.8 The cooling system shall provide for continuous pump operation in liquid or ambient temperatures up to one hundred four degrees (104°) Fahrenheit even when the motor is not submerged. Restrictions below this temperature are not acceptable.

6.11.22.9 Pumps for dry-pit service shall be provided with a motor cooling solution per this section ***without exception*.**

6.11.23 Temperature Sensors:

6.11.23.1 All stators shall incorporate thermal switches, embedded in the end coils of the stator winding, in series to monitor the temperature of each phase winding.

6.11.23.2 Should high temperature (260°F) occur, the thermal switches shall open, stop the motor and activate an alarm.

6.11.23.3 These thermal switches shall be used in conjunction with, and supplemental to, external motor overload protection and shall be connected to the control panel.

6.11.23.4 Sensors shall be wired to the specified motor protection relay for motor protection.

6.11.24 Moisture Detection:

6.11.24.1 Provide motors with a moisture detection system.

A. A float switch shall be installed in the seal leakage chamber. When the float switch is activated, the motor shall stop and an alarm shall be activated.

B. A second moisture detector shall be located in the motor junction box or inspection chamber.

6.11.24.2 All moisture detectors shall be wired to the motor junction box for connection to the specified motor protection relay.

6.11.24.3 Moisture detectors shall be either mechanical float switch or capacitance probe type as recommended by the manufacturer.

6.11.25 Motor Protection Relay:

6.11.25.1 Provide motor protection relay to protect motor from high temperature and moisture.

A. During normal pump operation, the temperature switch shall be closed and the leakage switch shall be normally open.

B. Sensor circuit shall operate on 12 or 24 VDC feed from the main relay body.

C. The relay shall be provided with LEDs to indicate status of leakage, temperature and supply voltage.

6.11.25.2 Power supply: 120 VAC.

6.11.25.3 Provide SPDT contacts for the following remote alarm functions:

A. Over-temperature.

B. Moisture detection.

6.11.25.4 UL or UR approved suited for panel installation.

6.11.25.5 Relay shall be mounted inside the associated pump's motor controller. Coordinate size, wiring and mounting of the relay into the motor controller.

6.11.25.6 Relay shall be provided by pump manufacturer.

6.11.26 The thermal switches and seal leakage float switches shall be monitored from the pump control panel.

6.11.27 The wires for the thermal switches and moisture sensor may be a part of a composite motor cable. If separate cables are provided, they shall be of adequate length to reach the control panel without splicing.

6.12 Junction Chamber

6.12.1 The junction chamber shall be sealed off from the stator housing and shall contain a terminal board for connection of power and pilot sensor cables.

6.12.2 Connection between the cable conductors and stator leads shall be made with threaded compression type binding posts permanently affixed to the terminal board.

6.12.3 The use of wire nuts or crimp-type connectors is not acceptable

6.12.4 Junction chamber containing the terminal board, shall be hermetically sealed from the motor by an elastomer compression seal.

6.13 Cables:

6.13.1 The pump shall have two cables.

6.13.1.1 One cable shall be for power and one cable shall be for control (the motor thermal sensors and moisture detector).

6.13.1.2 For smaller units it will be acceptable to have shielded sensor wires within the body of the power cable, precluding the need for a second pilot cable.

6.13.2 The cable design shall be suitable for installation in a municipal wastewater pumping station.

6.13.3 The cable length shall not exceed the product manufacturer's recommended length.

6.13.4 Developer shall be responsible for determining the length of cable required to wire the motors and sensors from the wetwell to the terminal boxes.

6.13.5 Developer shall provide additional cable length for slack to allow the pumps to be removed from the wetwell without disconnecting the cable at either end.

6.13.6 The power cable shall be of sufficient length to reach from the pump to the control panel terminal block without splicing.

6.13.7 The cable shall have enough slack such that it can be routed and secured out of the way of any equipment in the wet well.

6.13.8 The additional cable length shall be coiled and secured within the wet well.

6.13.9 The length of cable for slack shall be based on the pump manufacturer's recommendation.

6.13.10 The power cable shall be suitable for the submersible pump applications and sized according to NEC and ICEA standards.

6.13.11 The outer jacket of the cable shall be oil resistant.

6.13.12 The pilot cable shall be designed specifically for use with submersible pumps and shall be type SUBCAB (Submersible Cable).

6.13.12.1 The cable shall be shielded, multi-conductor type and shall be approved by Factory Mutual (FM).

6.13.12.2 The cable length shall be adequate to reach the junction box without the need for splices.

6.13.13 Cable Entry

6.13.13.1 The motor and cable shall be capable of continuous submergence underwater without loss of watertight integrity to a depth of 65 feet.

6.13.13.2 The cable entry junction chamber and motor shall be sealed from each other, which shall isolate the stator housing from foreign material gaining access through the pump top.

6.13.13.3 The cable entry assembly shall meet European Standards, unless otherwise permitted by FCPW.

6.13.13.4 The cable entry seal design shall preclude specific torque requirements to insure a watertight and submersible seal.

6.13.13.5 The cable entry shall consist of a single cylindrical elastomer grommet, flanked by washers, all having a close tolerance fit against the cable conductor insulation and compressed by the entry body containing a strain relief function, separate from the function of sealing the cable.

6.13.13.6 The assembly shall provide ease of changing the cable, when necessary, using the same entry seal.

6.13.13.7 The cable entry junction chamber and motor shall be separated by a terminal board, which shall isolate the interior from foreign material gaining access through the pump top.

6.13.13.8 Epoxies, silicones, or other secondary sealing systems shall not be considered acceptable.

6.14 Wet-Pit Configuration Mounting:

6.14.1 Pump Discharge Connection Seal:

6.14.1.1 The connection between the pump discharge connection seal shall be a metal-to-metal seal to effect a complete closure between the pump discharge flange and the mating connection on the anchor fitting.

6.14.1.2 Leakage through the seal shall not exceed 1.5 percent of the flow specified for Condition Point A when operating at pump shutoff head.

6.14.1.3 The seal shall be subject to field test for acceptance in accordance with the requirements of this Section.

6.14.2 Pump Anchorage and Guide System:

6.14.2.1 The pump shall be provided with a guide system to allow easy removal of the pump without entering the wetwell.

6.14.2.2 The guide rail system shall be a dual rail type.

6.14.2.3 The discharge connection shall be bolted to the structure as indicated and shall serve as a lower attachment for the guide rails.

6.14.2.4 The discharge connection shall be either horizontal or elbow discharge type.

6.14.2.5 Adapters shall be provided to connect pump base to standard flanges

6.14.2.6 The anchorage system shall be designed to transmit the forces specified in this Section safely to the structure.

6.14.2.7 Calculations and supporting documentation justifying the support design shall be provided.

6.14.2.8 The pump and guide rail system shall be designed to automatically connect the pump to the discharge piping when lowered into place on the discharge connection.

6.14.2.9 The design shall be non-sparking and shall conform to UL requirements for installation in a location classified in accordance with NFPA 70, Article 500 for Class 1, Group D, Division 1 locations, unless indicated otherwise.

6.14.2.10 The pump shall be easily removable for inspection or service:

A. Requiring no bolts, nuts or other fastenings to be removed for this purpose.

B. No need for personnel to enter the pump wetwell or sump.

6.14.2.11 Sealing of the pumping unit to the discharge connection shall be accomplished by a simple linear downward motion of the pump with the entire weight of the pumping unit guided to and pressing tightly against the discharge connections.

6.14.2.12 No portion of the pump shall bear directly on the floor of the sump and no rotary motion of the pump shall be required for sealing.

6.14.2.13 Guide bars provided for directing the pump into position or for removing the pump for maintenance shall steer the pump into proper contact with the discharge elbow.

6.14.2.14 Once the pump has been positioned on its support fitting at the discharge fitting, the guide bar system shall not be required for pump support.

6.15 Dry-Pit Configuration Mounting:

6.15.1 Inlet Elbow:

6.15.1.1 Provide a flanged suction elbow to provide a smooth transition of flow from the connected suction piping to the impeller eye.

6.15.1.2 Inlet elbow shall be of the concentric reducing type, sized to connect directly to the suction pipe diameter shown on the Drawings.

6.15.1.3 Handhole:

A. Provide a handhole, not less than 4 inches in diameter, for access to the impeller and wearing rings.

B. Contoured to match the inner contours of the elbow

C. Bolted-in-place design.

D. Drilled and tapped and fitted with a valved 2-inch diameter drain.

6.15.2 Pump Base Design and Supports:

6.15.2.1 Pumps shall be mounted to parallel concrete pedestal supports or metal pump stand, both designed by pump manufacturer.

6.15.2.2 Provide a suitable base plate, frame or other mounting provisions for anchorage to the concrete supports such that the anchor bolt holes shall be centered on the concrete pedestal supports.

6.15.2.3 Note that configuration requirements may not accommodate the pump manufacturer’s standard equipment mounting design.

6.15.3 Mounting Coordination:

6.15.3.1 Coordinate required height of concrete pedestal supports with required discharge piping elevations shown on the Drawings.

PART 7 MANUFACTURERS

7.1 FCPW has standardized on specific types of pumps for use at pump stations in an attempt to minimize the operation and maintenance costs associated with these pump stations.

7.2 Chopper or screw type pumps shall be considered preferable and shall be the type used unless determined inadequate for the application. Manufacturer's generally found acceptable are:

7.2.1 Hidrostal

7.2.2 Vaughan

7.2.3 Barnes

7.2.4 Flygt (N-series impeller)

7.2.5 KSB

7.2.6 Grandfos

7.2.7 FCPW approved equal.

PART 8 ACCESSORIES

8.1 Guide Rails and supports

8.1.1 Guide rails shall be Type 316 stainless steel.

8.1.2 Diameter shall be as specified by the pump manufacturer.

8.1.3 Guide rail systems must use minimum of two rails.

8.1.4 Upper and intermediate guide rail supports shall be Type 316 stainless steel.

8.1.5 The pump manufacturer shall provide the recommended quantity and locations of the guide rail supports to the Developer's Design Engineer.

8.2 Cable Holder & Supports

8.2.1 Cable holder shall be Type 316 stainless steel. A minimum of one cable holder for each cable shall be provided.

8.2.2 Power and pilot cable supports shall be provided and consist of a stainless steel wire braid sleeve with attachment loops or tails to connect to cable holders on the underside of the access frame.

8.2.3 Support for the cables shall be such that the bend radius of the cables shall not be exceeded.

8.3 Lifting Chain

8.3.1 Each pump shall be provided with adequate length of Type 316 stainless steel lifting chain.

8.3.2 The capacity of the lifting system shall be a minimum of 200 percent of the combined weight of the pump and motor assembly.

8.4 Anchor Bolts

8.4.1 Pump manufacturer shall provide all anchor bolts for pump manufacturer provided components based on manufacturer's calculations.

PART 9 SPARE PARTS

9.1 Provide the following spare parts for each model and size of pump furnished.

9.1.1 One (1) O-ring kit.

9.1.2 One complete set of all gaskets and seals

9.1.3 Two complete sets of all bearings

9.1.4 Two complete sets of mechanical seals

9.1.5 Two complete sets of discharge connection sealing devices

9.1.6 One removable cable seal chamber cap with cable length as required in this Section.

9.1.7 **Three complete O&M manuals. Two in hard copies and** one in searchable electronic copy.

9.1.8 One phase monitor relay and one (1) motor starter with overload block.

9.1.9 Five spare fuses for each type and rating provided.

9.1.10 Five spare lamps for each type provided.

9.1.11 Five spare relays and relay sockets for each type provided.

9.2 If a submersible transducer and controller are used, a spare transducer and controller shall be provided.

9.3 Additional spare parts may be identified by FCPW during the review phase based on the design of the pump station.

9.4 Spare parts shall be boxed and clearly labeled as to specific equipment it is provided for.

9.5 Spare parts shall be of the same type and quality as the parts provided in the original equipment package.

PART 10 SHOP TESTING

10.1 Quality Assurance

10.1.1 Impeller, motor rating and electrical connections shall first be checked for compliance to Developer's purchase order.

10.1.2 A motor and cable insulation test for moisture content and/or insulation defects shall be made.

10.1.3 Prior to submergence, the pump shall be run dry to establish correct rotation and mechanical integrity.

10.1.4 The pump shall be run at minimum submergence.

10.1.5 After the operational test, the insulation test shall be performed again.

10.2 Certification tests shall be performed on the actual assembled pumps to be supplied.

10.2.1 Pumps shall be tested in the manufacturer's facility and in accordance with the latest test code of the Hydraulic Institute Level A.

10.2.2 Tests shall cover a range from shut-off to a minimum of 20% beyond the specified design performance capacity.

10.2.3 Certification tests shall be conducted on each pump being supplied.

10.3 Pump performance curves for each condition point specified showing head, power, efficiency and NPSHR plotted against capacity.

10.3.1 Curves shall be provided to demonstrate operation at all speeds required to achieve the specified reduced speed operating conditions.

10.3.2 All curves shall clearly display the specified operating conditions, POR and the manufacturer's limits for the AOR.

10.4 A State of Georgia registered Professional Engineer shall certify each pump curve. Certified pump curves shall be submitted to FCPW.

10.5 All pumps that are not part of the manufacturer's standard offering (custom-engineered) shall have a witnessed test.

10.6 All expenses for witnessing the shop testing for 3 representatives of FCPW's choosing shall be included.

PART 11 FIELD TESTING

11.1 After completion of the installation, the equipment shall be field tested to demonstrate compliance with the specified performance requirements.

11.2 Refer to Section 13, Part 4, Paragraph 4.2

PART 12 TRAINING

12.1 Each pump station installation in Fulton County requires a minimum of 12 hours of on-site Operation and Maintenance training to be provided by the pump manufacturer to FCPW maintenance personnel, and shall be paid for by Developer. The pump manufacturer shall be present for the duration of the training.

PART 13 MANUFACTURER'S CERTIFICATION

13.1 Provide a certification by a qualified representative of the pumping system manufacturer that the equipment is installed properly, operating within the design parameters and will be warranted as specified herein.

13.2 Certification shall be based on a detailed inspection of the installation following the successful start-up of the systems.

PART 14 WARRANTY

14.1 The pump manufacturer shall warrant the units against defects in materials and workmanship in accordance with the following provision:

14.1.1 As provided by the manufacturer's standard warranty.

14.1.2 Minimum 2 years.

14.1.3 Warranty shall begin with the date of beneficial use.

14.2 This warranty shall be delivered, in writing, to FCPW and shall include, as a minimum, 100 percent full payment coverage for parts and labor.

SECTION 5

MINIMUM HYDRAULIC REQUIREMENTS

PART 1 PUMP STATIONS

1.1 Flow Considerations

1.1.1 Developer shall complete and submit pump station design calculations using the "Pump Station Design Calculation Form".

1.1.2 Calculations shall be done at "Pump On", “Operating Elevation”, "Pump Off" and "Alarm" levels.

1.1.3 Flow Calculations shall be based on the following:

1.1.3.1 Average annual daily flows.

1.1.3.2 2.5 peaking factor. FCPW may modify this value based on collection system and use, such as Inflow and Infiltration or non-residential users.

1.1.4 All influent sewers shall connect at a manhole upstream of the wetwell. This upstream manhole and the wetwell shall be connected by a single approach pipe.

1.1.5 The “approach pipe” shall be sized for storage and for future expansion of the pump station.

1.1.6 The invert of the approach pipe shall discharge at the low water level in the wetwell.

1.1.6.1 The flow into the wet well shall not be allowed to “free-fall.”

1.1.6.2 The maximum velocity of flow entering the pump station through the gravity sewer shall be limited to prevent entrainment of air and off-gassing and to prevent gasses from being sucked into the pump.

1.1.7 Wet well and pump intake design shall be designed for solids bearing liquids per ANSI/HI 9.6 and 9.8.

1.1.8 Circular wet wells shall have a conoidal bottom.

1.1.9 The flow of water into the pump shall be uniform, steady, without swirl and without entrained air.

1.1.10 Flow velocity into the pump intake bell, shall be targeted to be 5 fps at design flow, unless recommended otherwise by the selected pump manufacturer.

PART 2 WET WELL SIZING REQUIREMENTS

2.1 Wetwell volumes and geometry and size shall be dependent on station type and hydraulic requirements.

2.1.1 Submersible stations wetwells shall be eight (8) foot diameter minimum and sized in accordance with Hydraulic Institute Standards, latest edition.

2.2 For pumps stations with constant level control, the wet well shall be sized based on the assumption that additional future pumps will be installed (unless approved otherwise) and also to meet the emergency storage requirements stated later.

2.3 Based on pump design operating point, wet well shall be designed to provide available NPSH (NPSHA) with a margin of safety over the published Required NPSH (NPSHR) value based on the latest revisions of Hydraulic Institute (HI) Standards.

2.3.1 The following are the margins of safety:

2.3.1.1 NPSHA > 130% of the NPSHR, if the design operating flow is within the pump's Preferred Operating Range (POR: 70% to 120% of the pump's best efficiency point flow).

2.3.1.2 NPSHA > 180% of the NPSHR, if the design operating flow is in the pump's Allowable Operating Range (AOR).

2.4 Pumping Cycles

2.4.1 The wetwell volume shall be sized to prevent excessive cycling of the pumps. The pump start/stop cycling shall be limited by the pump manufacturer's recommendation but no more than one start per ten minutes with all pumps in service.

2.4.2 Stations designed for constant level control (variable speed) shall run continuously to maintain the level set point.

2.4.3 Constant speed pumping stations shall cycle to limit the number of pump starts. The minimum time between pump starts shall be 10 minutes at design flow.

2.5 Emergency Storage Requirements

2.5.1 Storage shall be provided above the high-level alarm equal to three (3) hours at peak flow.

2.5.1.1 Storage volume is calculated to be that volume between the high-level alarm and the lowest point of overflow (including basement and service tap elevations regardless of any backflow valves in the service lines).

2.5.1.2 Said storage may consist of any combination of line capacity, manhole capacity and wet well volume.

2.5.2 Additional storage tanks are not allowed.

PART 3 FORCE MAINS

3.1 Refer to Section 6

PART 4 DOWNSTREAM GRAVITY SEWER

4.1 An analysis of the hydraulic effects on downstream gravity sewers shall be completed by Developer’s Design Engineer.

4.2 If it is necessary to collect flow data for the existing sewer which will receive the flow from the pump station, Developer will be required to have flow meters installed per the direction of FCPW.

SECTION 6

FORCE MAIN REQUIREMENTS

PART 1 GENERAL

1.1 Unless specifically requested by the FCPW a force main shall only serve one (1) pump station.

1.2 Force mains shall be constructed using existing approved FCPW standard details and specifications.

1.3 Force mains with multiple diameter piping will not be allowed unless specifically approved by FCPW.

1.4 Force mains will not be allowed to discharge directly into the wet well of another pump station.

1.5 Within the proposed development:

1.5.1 The force main shall be located in a 10-foot wide utility easement immediately adjacent to the proposed right-of-way.

1.6 Outside of the proposed development:

1.6.1 The force main shall either be located within the State or County road right-of-way

1.6.2 In the case that the State or County Department of Transportation will not approve locating the force main within their right-of-way, a 20-foot wide utility easement immediately adjacent to the proposed right-of-way.

1.7 Separation from Potable Water Sources

1.7.1 Horizontal and Vertical Separations

1.7.1.1 Force mains shall maintain a ten (10) feet horizontal and eighteen (18) inches vertical separation below potable water mains.

1.7.1.2 Measurement shall be from outside of pipe to outside of pipe.

1.7.1.3 If site conditions do not allow such minimum separations, FCPW may allow deviation on a case-by-case basis if supported by data from Developer's Design Engineer.

1.7.1.4 Such deviation may allow installation of the force main closer to a potable water main under the following conditions:

A. The force main is in a separate trench or

B. The potable water main is on an undisturbed earth shelf located on one side of the force main and at an elevation such that the bottom of the potable water main is at least eighteen (18) inches above the top of the force main.

1.7.1.5 If it is impossible to obtain proper horizontal and vertical separation as described above, both the force main and potable water main must be constructed of HDPE DR 11 pipe or ductile iron pipe (by approved exception) meeting FCPW Standards and shall be pressure tested to two hundred (200) psi to assure water-tightness prior to backfilling.

1.7.2 Crossings

1.7.2.1 Force mains crossing over or under potable water lines shall be laid to provide a minimum vertical distance of eighteen (18) inches between the outside of the force main and the outside of the potable water main.

1.7.2.2 The crossing shall be arranged so that the force main joints will be equidistant and as far as possible from the water main joints.

1.7.2.3 Where a force main crosses over a potable water main, adequate structural support shall be provided for the force main to maintain line and grade.

1.7.2.4 When it is impossible to obtain the proper vertical separation as stipulated above, one of the following methods must be specified:

A. The force main shall be designed and constructed equal to the potable water main and shall be pressure tested to two hundred (200) psi to assure water tightness.

B. Either the force main or potable water main may be encased in a watertight casing pipe or concrete encasement which extends ten (10) feet on both sides of the crossing, measured perpendicular to the potable water main.

C. The casing pipe shall meet the material requirements of steel casing for bore and jack crossings.

1.8 Force Main Sizing

1.8.1 All force main piping shall be designed to convey wastewater at a velocity between three (3.0) feet per second (fps) and six (6.0) fps.

1.8.2 Wastewater velocity occurring in a force main shall be calculated using the continuity equation:

$$V = 0.049\left(\frac{Q_{PUMP}}{\mathrm{D}^2}\right)$$

Where:

V is the velocity in feet per second

Q is the flow rate of a single pump in gallons per minute

D is the diameter of the force main pipe in inches

1.9 Force mains will not be approved to flow downhill into the receiving manhole.

1.9.1 Gravity sewer lines must be installed to convey flow downhill to the existing receiving sewer system.

1.9.2 Exceptions to this requirement may be granted on a case-by-case basis if, in the opinion of FCPW, there is no benefit to FCPW of having gravity sewer in the particular location involved.

1.10 Velocity Requirements

1.10.1 Force main velocities shall be a minimum of 3 fps and maximum 6 fps with a target velocity of 5 fps.

1.10.2 Minimum size for force mains shall be 6 inches in diameter.

1.10.3 The minimum velocity of 3 fps shall be achieved with one pump operating.

1.11 Operating Pressures

1.11.1 Force mains shall be designed for maximum allowable total dynamic head (TDH) of 150 feet.

1.11.2 Heads greater than 150 feet shall be coordinated with FCPW.

1.12 Headloss Calculations

1.12.1 Refer to Paragraph 2.5 of Section 3 for force main headloss calculation requirements.

1.13 Transient Analysis

1.13.1 A transient analysis shall be completed for each pump station and force main design.

1.13.2 Transient analysis calculations shall be submitted along with a statement by Developer's Design Engineer (registered in the State of Georgia) that the surge (water hammer) for the proposed pumping station and force main will be within acceptable limits.

1.13.3 The analysis shall include results for operation of the following:

1.13.3.1 With one pump running.

1.13.3.2 With all pumps running simultaneously.

1.13.4 Analysis shall be made under an emergency shutdown scenario (e.g. full loss of power at maximum anticipated flow rate.

1.13.5 The Developer's Design Engineer shall show the following:

1.13.5.1 The transient surge will not exceed the working pressures of all pumps, force main, valves and appurtenances.

1.13.5.2 The factor of safety between the pipe pressure class and the maximum pipe pressure is greater than or equal to 1.5 for each section of the station and force main.

1.13.6 The analysis shall also address the following:

1.13.6.1 Placement of air release/vacuum valves.

1.13.6.2 The need for surge relief.

1.13.6.3 The proposed force main restraints.

1.13.7 Force main design shall be such that active devices for control of transient hydraulic conditions are minimized to the greatest extent possible.

1.13.8 The following, with justification, may be acceptable control strategies after review of the transient analysis:

1.13.8.1 Control valves that open and close slowly.

1.13.8.2 Construction of the force main using a higher-strength pipe.

1.13.8.3 Vacuum relief valves.

1.13.8.4 Specialized control and/or release valves and other devices designed to prevent transient pressures from reaching levels that could damage the pump station and force main systems.

1.14 Special Design Considerations

1.14.1 Freeze Protection

1.14.1.1 Protection from freezing should be provided for pipes above ground (such as bridge crossings).

1.14.2 Thrust Restraint

1.14.2.1 Thrust blocking underground should be considered whenever pipe changes direction (tees and bends) and where unbalanced thrust forces (pressure and momentum) exist.

1.14.2.2 Refer to FCPW Standard Specifications Section 04 05 01 for thrust restraint requirements.

1.14.2.3 Refer to FCPW Standard Details 132A and 132B for thrust blocking details.

1.14.2.4 Pipe thrust restraints need to be considered for pipelines above ground as well.

1.14.2.5 Refer to FCPW Standard Details 125, 126 and 127 for tie-rod details.

1.14.3 Cathodic Protection

1.14.3.1 Cathodic protection of ductile iron pipe should be considered whenever the following conditions exist:

A. Corrosive soils.

B. Stray current from MARTA or Atlanta Gas Light (AGL) facilities.

1.14.3.2 Testing for corrosive soils or stray currents shall be at no cost to FCPW and shall be at the discretion of the same.

PART 2 PIPING

2.1 All force mains, including the pump discharge through the meter and valve vault, shall be constructed using High Density Polyethylene (HDPE) pipe and fittings.

2.1.1 Epoxy lined ductile iron pipe may be used on exception basis, prior FCPW approval shall be required.

2.2 High Density Polyethylene (HDPE) Pipe

2.2.1 Material

2.2.1.1 Resins for HDPE pipe and fittings shall conform to the following Standards:

A. ASTM D3350 - "Standard Specification for Polyethylene Plastics Pipe and Fitting Materials".

B. ASTM F412 - "Standard Terminology Relating to Plastic Piping Systems".

2.2.1.2 Pipe and fittings shall be made from the resin meeting the requirements of the PPI material designation PE 4710.

2.2.1.3 PE4710 material (compound) shall conform to material requirements specified in ASTM F412 for pipe and ASTM D3261 for fittings as applicable for the pipe or fitting.

2.2.1.4 PE4710 material (compound) shall meet the requirements of ASTM D3350 and shall meet or exceed a cell classification of 445574 per ASTM D3350.

2.2.1.5 PE4710 material (compound) shall have a hydrostatic design stress (HDS) rating for water at 73°F (23°C) of not less than 1000 psi that shall be listed in PPI TR-4 in the name of the pipe manufacturer.

2.2.1.6 PE4710 material (compound) shall have a hydrostatic design basis (HDB) rating at 140°F (60°C) of not less than 1000 psi that shall be listed in PPI TR-4 in the name of the pipe manufacturer.

2.2.1.7 PE4710 pipe and fitting material (compound) in PE4710 pipe and fittings shall contain color and ultraviolet (UV) stabilizer meeting the requirements of Code C or E per ASTM D3350.

A. Code C material shall contain 2 to 3 percent carbon black to provide indefinite protection against UV degradation when material from the pipe is tested in accordance with ASTM D1603 or ASTM D4218.

B. Code E material used for coextruded OD color stripes or a coextruded ID color layer shall contain sufficient UV stabilizer to protect the pipe against UV degradation for at least 24 months of unprotected outdoor exposure. Coextruded color PE compound material shall be PE4710 pipe material compound, varying only by color and UV stabilizer.

2.2.1.8 Clean rework materials derived from pipe production by the same manufacturer are acceptable as part of a blend with new material for the production of new pipe provided that the rework material is the same PE4710 material designation as the new material (compound) to which it is added. Finished products containing rework material shall meet the requirements this specification.

2.2.2 Pipe and Fittings

2.2.2.1 All pipe and fittings shall be manufactured in ductile iron pipe sizes (DIPS) in accordance with the following Standards.

A. ANSI/AWWA C906 - "Polyethylene Pipe and Fittings, 4 in. (100 mm) through 63 in. (1,575 mm) for Water Distribution".

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

C. ASTM F714 - "Standard Specification for Polyethylene (PE) Pipe (SDR-PR) Based on Outside Diameter".

D. ASTM F2619 - "Standard Specification for High Density Polyethylene (PE) Line Pipe".

E. ASTM F2206 - "Standard Specification for Fabricated Fittings of Butt-Fused Polyethylene (PE) Plastic Pipe, Fittings, Sheet Stock, Plate Stock or Block Stock".

F. ASTM D3261 - "Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing".

G. ASTM F1055 - "Standard Specification for Electrofusion Fittings for Outside Diameter Controlled Polyethylene Pipe and Tubing".

2.2.2.2 Pipes

A. HDPE pipes shall be DR 11 with a minimum pressure class rating of 200 psi.

B. HDPE pipe and butt fusion fittings shall have plain ends for butt fusion.

C. The pipe shall contain no recycled compound except for rework material generated in the manufacturer's own plant that has the same cell classification as the material to which it is being added.

D. The pipe shall be homogeneous throughout and free of visible cracks, holes, voids, foreign inclusions or other defects that may affect the wall integrity.

E. Permanent identification of piping service shall be provided by co-extruding longitudinal green, lavender or purple stripes into the pipe outside surface.

1) The striping material shall be the same material as the pipe material except for color.

2) Stripes printed or painted on the outside surface shall not be acceptable.

F. The nominal pipe diameter shall be specified on the Drawings. The DR (dimension ratio) and the pressure rating of the pipe shall be as noted on the Drawings.

G. HDPE pipes may be deflected subject to approval by FCPW.

1) The following table shows maximum deflection based upon the allowable strain of the pipe wall.

2) Potential flow restrictions, surge and other non-trench stability and pipe strain issues may reduce the values shown here per FCPW recommendations.

3) The bend radius multiplier determines the minimum radius of the pipe curvature and is calculated by multiplying the outside diameter of the pipe by the multiplier from the appropriate DR used.

4) Bending radius allowed by the manufacturer can vary. Verify the multiplier with the manufacturer. In no case shall the radius be less than 125% of the manufacturer's permitted multiplier.

HDPE Pipe Dimension Ratio (DR)	Allowable deflection (percent)	Bend Radius Multiplier
32.5	8.1	50
26.0	6.5	45
21.0	5.2	40
19.0	4.7	37.5
17.0	4.2	32.5
15.5	3.9	30
13.5	3.4	27.5
11.0	2.7	25

H. Pipe Markings

1) Pipe shall be permanently marked using heated indent printing in accordance with ASTM F714 as applicable for the pipe size including:

a) Nominal size and sizing system, e.g., DIOD.

b) SDR 11.

c) Extrusion production-record code.

d) Manufacturer's Trademark or trade name.

e) Standard Designation, ASTM F714, material designation and pressure rating or pressure class for water at 73°F.

f) Marking the Standard Designation on the pipe shall serve as the manufacturer's certification that the pipe has been manufactured, sampled and tested, and has been found to comply with the requirements of the Standard.

g) The ASTM D3035 or ASTM F714 pipe pressure rating for water at 73°F shall be "PE4710 PRXXX" where XXX = pressure rating in psi.

h) The AWWA C901 pipe pressure class for water at 73°F shall be "PE4710 PCXXX" where XXX = pressure class in psi.

i) The AWWA C906 pipe pressure class for water at 73°F shall be "PE3408 PCXXX[1]" where XXX = pressure class in psi.

2) Extrusion production-record code.

3) Manufacturer's Trademark or trade name.

2.2.2.3 Fittings

A. Butt fusion, saddle fusion, electrofusion and fabricated fittings shall be manufactured from PE4710 material (compound) in accordance with this specification.

B. Molded fitting shall be used for 12-inch or smaller pipe.

C. Fabricated fittings shall be used for pipes larger than 12-inch.

D. Fittings shall comply with the following Standards:

1) ASTM D3261 for molded butt fusion and saddle fusion fittings, flange adapters and MJ adapters

2) ASTM F2206 for fabricated butt fusion fittings

3) ASTM F1055 for electrofusion fittings.

E. Fittings shall comply with the marking requirements of the following Standards:

1) ASTM D3261 for molded butt and saddle fusion fittings, flange adapters and MJ adapters.

2) ASTM F2206 for fabricated butt fusion fittings.

3) ASTM F1055 for electrofusion fittings.

F. Fittings shall have pressure class ratings not less than the pressure class rating of the pipe to which they are joined.

G. Plain end butt fused fittings shall be used when joining polyethylene materials.

[1] Per AWWA C906, PE3408 marking and PE3408 PCXXX is required. Pipe may be manufactured using PE4710 material (compound) that is listed in PPI TR-4 as meeting PE3408 requirements.

H. Mechanical fittings shall be used only when joining polyethylene materials to different piping materials and approved by FCPW.

I. The fittings shall contain no recycled compound except for rework material generated in the manufacturer's own plant that has the same cell classification as the material to which it is being added.

J. The fittings shall be homogeneous throughout and free of visible cracks, holes, voids, foreign inclusions or other defects that may affect the wall integrity.

K. Butt fusion fittings shall comply with ASTM D3261.

L. Mechanical fittings used with polyethylene pipe shall be specifically designed for, or tested and found to be acceptable for, use with polyethylene pipe.

2.2.2.4 Fusion Joints

A. Unless otherwise specified, PE4710 pipe and fittings shall be assembled in the field with butt fusion, saddle fusion or electrofusion joints.

B. ASTM F2620 and the pipe manufacturer's recommended procedure (WL Plastics WL101) shall be observed for butt fusion and saddle fusion joints.

C. ASTM F1290 and the electrofusion fitting manufacturer's recommended joining procedure shall be observed for electrofusion joints.

D. Field butt fusion, saddle fusion and electrofusion joints shall be made by Fusion Technicians that are qualified in accordance with this specification to make the specific fusion joint type.

E. Field fusion joints shall be recorded and documented in accordance with this specification.

2.2.2.5 Fusion Technician Requirements

A. Each Fusion Technician shall be separately qualified to make each type of fusion joint.

1) Fusion joint types are butt fusion, saddle fusion and electrofusion.

2) Qualification to make one type of fusion joint shall not qualify a Fusion Technician to make a different type of fusion joint.

B. Each Fusion Technician making butt fusion joints shall be qualified to make butt fusion joints in accordance with ASTM F2620.

1) Qualification shall have occurred no earlier than 12 months before performing fusion joining on site in accordance with this specification.

2) Qualification shall be a documented demonstration of proficiency by making joints in accordance with ASTM F2620 that are proved to be satisfactory by destructive testing in accordance with ASTM F2620.

C. Each Fusion Technician making saddle fusion joints shall be qualified to make saddle fusion joints in accordance with ASTM F2620.

1) Qualification shall have occurred no earlier than 12 months before performing on-site fusion joining in accordance with this specification.

2) Qualification shall be a documented demonstration of proficiency by making joints in accordance with ASTM F2620 that are proved to be satisfactory by destructive testing in accordance with ASTM F2620.

D. Each Fusion Technician making electrofusion fitting joints shall be qualified to make electrofusion fitting joints in accordance with ASTM F1290 and the electrofusion fitting manufacturer’s recommended procedure.

1) Qualification shall have occurred no earlier than 12 months before performing on-site fusion joining in accordance with this specification.

2) Qualification shall be a documented demonstration of proficiency by making joints in accordance with ASTM F1290 and the electrofusion fitting manufacturer’s recommended procedure that are proved to be satisfactory by destructive testing in accordance with ASTM F1290 and the electrofusion fitting manufacturer’s recommended procedure.

2.2.2.6 Connections and Fittings for Pressure Applications

A. Connections shall be defined in conjunction with the linking of project piping as well as the tie-ins to other piping systems.

B. Mechanical Fittings

1) Acceptable mechanical fittings for use with PE4710 pipe and fittings shall be mechanical fittings that are qualified by the mechanical fitting manufacturer for use with HDPE pipe and fittings.

2) Mechanical fittings for use with HDPE pipe shall provide restraint against longitudinal separation that is inherent to the design of the joint.

3) Mechanical joints that do not provide restraint against pull-out or push-off are prohibited.

4) Mechanical connections to non-HDPE devices and appurtenances shall be by bolted flange adapter or MJ adapter.

5) Flange adapter and MJ adapter connections shall be assembled, installed and tightened in accordance with flange adapter or MJ adapter manufacturer's instructions.

6) Flange bolt tightening shall be in accordance with PPI TN-38

7) Where PE4710 pipe is connected to gasketed mechanical/flange joint fittings or appurtenances, the connection shall be made by butt fusing a PE4710 MJ/flange Adapter to the PE4710 pipe and connecting the PE4710 MJ/flange Adapter to the mechanical joint/flange fitting or appurtenance.

C. Gasketed Push-On Fittings

1) Gasketed push-on fittings shall be fitted with external mechanical restraints that span across the joint and are assembled in accordance with restraint manufacturer's instructions.

2) Thrust blocking does not provide acceptable restraint and is prohibited.

3) Where plain-end PE4710 pipe is assembled with push-on fittings, the PE4710 pipe end shall be fitted with electrofusion restraints so that external mechanical restraint may be secured to the PE4710 pipe

D. Sleeve-type couplings

1) Sleeve-type mechanical couplings shall be manufactured for use with HDPE pipe and shall be restrained as indicated on the Drawings and in these specifications.

2) Unrestrained sleeve-type couplings are prohibited.

E. Expansion and flexible couplings

1) Expansion-type mechanical couplings are prohibited.

F. Connection hardware

1) Bolts and nuts for buried service shall be made of non-corrosive, high-strength, low-alloy steel having the characteristics specified in ANSI/AWWA C111/A21.11, regardless of any other protective coating.

2.2.2.7 Connection to non-pressure manholes and structures

A. PE4710 pipe and fittings shall be connected to manholes and other structures to provide a leak-free, properly graded flow into or out of the manhole or structure.

B. Connections to existing manholes and structures shall be as specified and shown on the Drawings.

1) For a cored or drilled opening provide a flexible, watertight connection that meets and/or exceeds ASTM C923.

2) For a knock out opening, provide a watertight connection (waterstop or other method) meeting the material requirements of ASTM C923 that is securely attached to the pipe with stainless steel bands or other means.

3) Grout opening in manhole wall with non-shrink grout. Pour concrete collar around pipe and outside manhole opening.

C. Connections to a new manhole or structure shall be as specified and shown on the Drawings.

1) A flexible, watertight gasket per ASTM C 923 shall be cast integrally with riser section(s) for all precast manhole and structures.

2) Drop connections shall be required where shown on Drawings.

3) Grout internal joint space with non-shrink grout

D. Approved suppliers

1) Pipe and fitting suppliers shall be approved by the FCPW.

2) The following pipe manufacturers are approved:

a) WL Plastics

b) Chevron

c) Phillips 66 Driscopipe

d) Or approved equal

2.2.2.8 Warranty

A. Pipe and fitting suppliers shall provide a two-year warranty covering defects in product material and workmanship.

1) A successful pressure test or pressure leak test prior to the expiration of the warranty period shall not relieve the supplier of warranty responsibility for the full warranty term.

B. Fusion providers shall provide a two-year warranty from the date of installation acceptance, covering defects in fusion joining workmanship and shall provide for remaking defective butt fusion, saddle fusion or electrofusion joints.

1) A successful pressure test or pressure leak test prior to the expiration of the warranty period shall not relieve the installer of warranty responsibility for the full warranty term.

2.3 Ductile Iron Pipe (DIP)

2.3.1 DIP requirements shall be per established FCPW Standards or as listed herein, whichever requirement is more stringent.

2.3.2 DI pipe, appurtenances and fittings shall conform to the latest requirements of ANSI/AWWA C151/A21.51, “Ductile Iron Pipe, Centrifugally Cast in Metal Molds for Water or Other Liquids”. All pipes, valves and fittings shall be epoxy lined.

2.3.3 The thickness and pressure class of DI pipe required for the installation and operating conditions during the expected service life of the force main shall be determined in accordance with the latest requirements of ANSI/AWWA C150/A21.50, “Thickness Design of Ductile Iron Pipe”.

2.3.4 Flanged DI pipe shall conform to the latest requirements of ANSI/AWWA C115/A21.15, “Flanged Ductile Iron Pipe with Ductile Iron or Gray Iron Threaded Flanges”.

2.3.5 Fittings for DI pipe shall conform to the latest requirements of one of the following:

2.3.5.1 ANSI/AWWA C110/A21.10, “Ductile-Iron and Gray- Iron Fittings, 3 In. through 48 In. for Water and Other Liquids”

2.3.5.2 ANSI/AWWA C153/A21.53, “Ductile Iron Compact Fittings, 3 In. through 24 In. and 54 In. through 66 In., for Water Service”.

2.3.6 Pipe Joints

2.3.6.1 Buried DI pipe shall have mechanical or gasketed push-on type joints.

2.3.6.2 Exposed DI pipe shall have flanged joints.

2.3.6.3 Restrained joint DI pipe may be used for anchoring purposes.

2.3.6.4 Gaskets shall be manufactured of vulcanized natural or synthetic rubber in accordance with the latest requirements of ANSI/AWWA C111/A21.11, “Rubber Gasket Joints for Ductile Iron and Gray- Iron Pressure Pipe and Fittings”.

2.3.7 Corrosive Environments

2.3.7.1 Consideration shall be given to the existence of, or the potential for, development of corrosive environments within and outside the force main shall be performed.

2.3.7.2 Sources of corrosion may include:

A. Acidic soils.

B. Septic wastewater.

C. Air entrainment within the force main.

D. Stray currents.

2.3.7.3 Where corrosion is deemed to be a serious problem, DI pipe shall be provided with the following as appropriate:

A. Cathodic protection.

B. An internal/external encasement.

C. Lining or coating appropriate for the pipe material and situation.

1) Such encasements, linings and coatings shall be manufactured or applied in accordance with the appropriate ANSI and AWWA Standards.

2.3.8 Cleaning / Maintenance

2.3.8.1 A self-cleansing velocity of at least three (3.0) feet per second shall be provided throughout the length of the force main. This will resuspend any solids that may have settled out.

2.3.8.2 If the length of force main exceeds five thousand (5,000) feet, Developer shall provide all of the following to further prevent the accumulation of solids:

A. Drain or blow-off valves provided at all low points in the force main. Such valves shall be either connected to an available entry point into the wastewater collection system, provided with a connection for a vacuum pumper truck, and designed with some other method to prevent an intentional discharge of wastewater during their operation.

B. Flushing ports along the length of the force main as well as a water supply of sufficient quantity and pressure. Such ports shall either be connected to an available entry point into the wastewater collection system, provided with a connection for a vacuum pumper truck, and designed with some other method to prevent an intentional discharge of wastewater during their operation.

2.3.9 Stream Crossings

2.3.9.1 Force mains shall be routed such that the number of stream crossings is minimized. When a stream crossing is required by the design, the crossing shall be as nearly perpendicular to the stream flow as possible and shall be buried under the stream bed with 3-ft minimum cover from top of pipe or casing.

2.3.9.2 DI pipe with joints equivalent to water main standards or a watertight ferrous encasement pipe shall be used to construct force mains that cross streams.

2.3.9.3 Force main bedding, haunching, and backfill shall be appropriate for the installation location and pipe material. However, the ability of the bedding and backfill material to readily erode, cause siltation, damage the force main during installation and corrode the force main after installation shall also be considered.

2.3.9.4 No aerial stream crossing will be allowed.

2.3.10 Slope

2.3.10.1 No segments of the force main can have zero slopes, to limit the accumulation of gasses. Low points shall also be avoided to prevent the accumulation of solids.

2.3.10.2 High points shall have air release combination valves as determined by specifics of the design.

2.3.11 Additional requirements are presented in Section 3 of these Guidelines.

2.3.12 The required pipe class shall be such that the “manufacturer’s allowable working pressure” is not less than either of the following:

2.3.12.1 A minimum of twice the design working pressure

2.3.12.2 One and one half times the design surge pressure,

2.3.12.3 Whichever is greater.

2.3.13 Internal Lining Requirements

2.3.13.1 Force mains shall have a corrosion resistant internal lining. Lining shall be Protecto 401 ceramic epoxy or FCPW approved equal.

2.3.14 External Coating Requirements

2.3.14.1 Developer shall conduct an assessment of the proposed route of the force main to determine if there are potential sources of external corrosion such as stray currents or corrosive soils.

2.3.14.2 The results of the analysis shall be submitted to FCPW for review and approval.

2.3.14.3 The force main shall be wrapped in polyethylene if such corrosion sources exist.

2.3.14.4 If sources of potential corrosion exist which are not mitigated by wrapping, the force main shall be provided with the required means for protecting the force main from corrosion.

2.3.15 The top third of the pipe shall be painted green.

2.3.16 Thrust Restraint

2.3.16.1 Pipe under pressure shall be adequately restrained to resist thrusts that may develop at bends, tees, plug and at any other location where a change in flow direction occurs.

2.3.16.2 Requirements shall be per established FCPW standards or as listed herein, whichever requirement is more stringent.

2.3.16.3 Thrust restraint devices shall be designed to withstand force main pressures of at least twenty-five percent (25%) greater than the maximum pump shut-off head plus an allowance for water hammer and an appropriate factor of safety.

2.3.16.4 All fittings, valves and dead-ends shall have two (2) forms of thrust restraint.

A. Acceptable thrust restraint shall include the following:

1) Restrained joint glands,

2) Field lock gaskets (on piping only)

3) Threaded rods

4) Concrete blocking

B. Concrete Thrust Blocks

1) Concrete thrust blocks shall be located between the fitting to be anchored and undisturbed soil material.

2) Appropriate thrust reaction block bearing areas shall be calculated based not only on the maximum expected force but also on the soil material.

3) Concrete thrust blocks shall have a minimum compressive strength of three thousand (3,000) pounds per square inch.

4) For thrust blocking details, refer to Fulton County Standard Details 132A and 132B.

5) For thrust restraint installation with tie-rod details, refer to Fulton County Standard Details 125, 126 and 127.

C. Self-restrained joints or joints restrained with tie rods and clamps shall both be acceptable.

D. In both cases, component parts shall either be manufactured of corrosion-resistant materials or coated liberally with a corrosion-retarding product

E. Developer's Design Engineer shall be responsible for calculating the length of pipe from each fitting that requires restrained joints. Calculations shall be submitted to FCPW for review.

2.3.16.5 Pipe thrust restraints need to be considered for pipelines above ground as well.

2.3.16.6 Restrained Joint Pipe

2.3.16.7 The table below shows the acceptable restrained joint options. However, restrained joined pipe does not waive the required thrust blocking below ground. Above ground piping shall be designed using restrained joint piping with expansion and contraction considerations and shall be approved by FCPW

Acceptable Restrained Joints				
Diameter (inches)	**ACIPCO**	**U.S. Pipe**	**McWayne**	**Generic**
4 - 12	Fast-Grip Flex Ring	Field LokTR Flex	Push-On Restrained Joint Type A	MJ with Retainer Gland
16 - 24	Fast-Grip Flex Ring	Field LokTR Flex	Push-On Restrained Joint Type A	MJ with Retainer Gland
30 - 36	Flex Ring	TR Flex	Push-On Restrained Joint Type B	MJ with Retainer Gland
42 - 48	Lok-Ring	TR Flex	N/A	MJ with Retainer Gland
54 - 64	Lok-Ring	TR Flex	N/A	N/A

PART 3 VALVES

3.1 Isolation valves

3.1.1 Acceptable isolation valves shall be plug valves.

3.1.2 Refer to Section 3, Part 5, Paragraph 5.5.3 for provisions applicable to buried valves.

3.1.3 Valves shall be Dezurik, Val-Matic, or approved equal.

3.2 Air/Vacuum Valves

3.2.1 Refer to Section 3, Part 5, Paragraph 5.5.4 for details.

PART 4 DISCHARGE MANHOLES

4.1 The discharge manhole shall be designed to transition the discharge from the force main into the gravity sewer to mitigate the release of gases from the wastewater.

4.2 Existing Manholes

4.2.1 When a proposed force main will discharge into an existing manhole on a gravity sewer, the existing manhole shall have a corrosion resistant coating installed in it or be replaced with a composite manhole.

4.2.2 An existing precast concrete manhole shall be lined with coating capable of resisting corrosion caused by hydrogen sulfide gases and other constituents found in wastewater.

4.2.3 An existing precast concrete manhole shall be coated with one of the following:

4.2.3.1 Two (2) coats of three (3) mills epoxy,

4.2.3.2 Three (3) mm of 40% fiberglass and 60% resin spray liner

4.2.3.3 Precast lined with three (3) mm of HDPE.

4.2.4 Precast section joints/seams shall be wrapped with eight (8) inch joint wrap.

4.2.5 Surface preparation, thickness, mixing and application shall be in accordance with the manufacturer's instructions.

4.2.6 The receiving manhole shall have a four (4) inch vent with an activated carbon filter canister attachment to control odor. The activated carbon filter requirements are provided in Section 3, Paragraph 7.6.

4.2.7 An existing brick manhole shall be replaced with a new manhole.

4.3 New Manholes

4.3.1 When a new manhole is installed as the discharge manhole, the manhole shall be constructed of composite materials capable of resisting corrosion caused by hydrogen sulfide gases and other constituents found in wastewater.

4.3.2 Composite or HDPE manholes shall be manufactured by:

4.3.2.1 U.S. Composite Pipe, Inc.

4.3.2.2 Sewer Shield Composite, LLC

4.3.2.3 FCDWR Division approved equal

PART 5 TESTING

5.1 Pressure and Leakage Testing

5.1.1 Refer to Section 13, Part 4, Paragraph 4.1

SECTION 7

ELECTRICAL GUIDELINES

PART 1 ELECTRICAL DESIGN CRITERIA

1.1 Governing Codes and Standards

1.1.1 NFPA 70 – National Electric Code

1.1.2 NFPA 70E – Standard for Electrical Safety in the Workplace

1.1.3 NFPA 820 – Standard for Fire Protection in Wastewater Treatment and Collection Facilities

1.1.4 NFPA 110 – Standard for Emergency and Standby Power Systems

1.1.5 ASTM A510, Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel.

1.1.6 ASTM B633, Specification for Electrodeposited Coatings of Zinc on Iron and Steel.

1.1.7 TIA/EIA-485, Electrical Characteristics of Generators and Receivers for Use in Balanced Digital Multipoint Systems (known as RS-485).

1.1.8 UL 13, Power-Limited Circuit Cables.

1.1.9 UL 1581, Electrical Wires, Cables and Flexible Cords.

1.1.10 UL VW-1, Vertical Wire Flame Test.

1.1.11 UL 910, Safety Test for Flame-Propagation and Smoke-Density Values for Electrical and Optical-Fiber Cables Used in Spaces Transporting Environmental Air

1.1.12 All applicable federal, state and local codes.

1.2 Underground and above ground power service installation is presented in Standard Detail P-002 and P-003, respectively, in Appendix B.

1.3 Common Work

1.3.1 Raceway

1.3.1.1 Exposed, Outdoor: Aluminum/PVC Coated Rigid Steel, 3/4-inch minimum size

1.3.1.2 Exposed, Indoor: Aluminum/Galvanized Rigid Steel, 3/4-inch minimum size

1.3.1.3 Underground: Schedule 40 PVC conduit, encased in steel reinforced concrete ductbanks, 1-inch minimum size.

1.3.1.4 Coat the top of ductbanks with red dye.

1.3.1.5 Provide marker tape for utility location services.

1.3.1.6 Separate conduits shall be supplied for analog, discrete, communication and power conductors.

1.4 Wire and Cable

1.4.1 480V feeder and motor circuit:

1.4.1.1 Conductor and cable applications

A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.

B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted or required.

C. Nonmetallic-sheathed cable is not permitted.

1.4.1.2 Conductor and cable general requirements

A. Provide products that comply with requirements of NFPA 70.

B. Provide products listed, classified and labeled as suitable for the purpose intended.

C. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.

D. Comply with NEMA WC 70.

E. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.

F. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.

G. Conductors for Grounding and Bonding: Comply with NFPA 70 ARTICLE 250.

H. Conductor Material:

1) Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B787M unless otherwise indicated.

2) Tinned Copper Conductors: Comply with ASTM B33.

3) Aluminum Conductors (only where specifically indicated or permitted for substitution): AA-8000 series aluminum alloy conductors recognized by ASTM B800 and compact stranded in accordance with ASTM B801 unless otherwise indicated.

1.4.2 240V/208V/120V Branch Circuits:

1.4.2.1 Minimum conductor size:

A. Branch Circuits: 12 AWG.

B. Exceptions:

1) 20 A, 120 V circuits longer than 75 feet: 10 AWG, for voltage drop.

2) 20 A, 120 V circuits longer than 150 feet: 8 AWG, for voltage drop.

1.4.2.2 Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

1.4.3 Control Circuits: Stranded Conductors.

1.4.4 Instrumentation signal circuits:

1.4.4.1 Type of Cables:

A. Shielded instrumentation cables.

B. Data communication cables.

1.4.5 Medium Voltage Power Cables (where applicable):

1.4.5.1 Quality Standards: IEEE C2 and NFPA 70.

1.4.5.2 Cable:

A. Type: MV105.

B. Conductor: Copper.

C. Conductor Stranding: Compact round, concentric lay.

D. Strand Filling: Conductor interstices are filled with impermeable compound.

E. Conductor Insulation: Ethylene-propylene rubber:

1) Voltage Rating: 1kV and 35 kV.

2) Insulation Thickness: 133 percent for operating voltages for one hour r at the corresponding voltage.

F. Shielding: Copper tape.

G. Shielding and Jacket: Corrugated copper drain wires embedded in extruded, chlorinated, polyethylene jacket.

H. Three-conductor cable assembly with ground conductors.

I. Cable Sheath: Interlocked aluminum.

J. Cable Jacket: Sunlight-resistant PVC.

1.4.5.3 Connectors:

A. Copper-Conductor Connectors: Copper shear bolted.

1.4.5.4 Solid Terminations:

A. Multi-conductor cable sheath seals.

B. Shielded-cable terminations.

1.4.5.5 Separable insulated connectors with

A. Splice Kits

B. Fault indicator

1.4.5.6 Field Quality Control

A. Tests and Inspections:

1) Perform each visual and mechanical inspection and electrical test stated in NETA ATS. Certify compliance with test parameters.

a) All conductors are to be checked for continuity. Inspect and test in accordance with NETA ATS

b) Insulation resistance testing using a megohmmeter on all low voltage feeder circuits.

2) Perform DC high potential tests on all 5kV conductors. Disconnect surge protective devices (SPDs) prior to performing any high potential testing. Replace SPDs damaged by performing high potential testing with SPDs connected.

1.4.6 Wire identification: provide wire/cable markers for all conductors and cables at each end and at intermediate pull points. Wire tag shall include source and destination equipment tags plus terminal numbers.

1.4.6.1 Conductor Color Coding:

A. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.

B. Color Coding Method: Integrally colored insulation.

1) Conductors size 4 AWG and larger may have black insulation color coded using vinyl color coding electrical tape.

C. Color Code:

1) 208Y/120 V, 3 Phase, 4 Wire System:

a) Phase A: Black.

b) Phase B: Red.

c) Phase C: Blue.

d) Neutral/Grounded: White.

2) 480/277 V, 3 Phase, 4 Wire System:

a) Phase A: Yellow

b) Phase B: Orange

c) Phase C: Brown

d) Neutral/Grounded: Gray

3) Equipment Ground, All Systems: Green.

4) Medium Voltage Color Code

a) Phase A: Black.

b) Phase B: Red.

c) Phase C: Blue.

d) Neutral/Grounded: White.

5) Travelers for 3-Way and 4-Way Switching: Pink.

6) For control circuits, comply with manufacturer's recommended color code.

1.5 Enclosures, Pull Boxes, etc.

1.5.1 Enclosures for electrical and control components for the pump station shall be located outside of the wet well and in a location such that they are readily accessible, ensure maximum electrical and personnel safety and are protected from damage due to vehicular traffic and flooding up to 500 year flood level.

1.5.2 All electrical and control panels shall be installed at a minimum five (5) feet from the fence. Reference Standard Detail P-001 in Appendix B.

1.5.3 Electrical and control enclosure example layouts are provided in Standard Detail P-023, 240 V, and Standard Detail P-025, 480V, Appendix B.

1.5.4 Switching gear (transfer switch, breakers, etc.) shall be mounted in a panel box of NEMA 4X Stainless Steel rating with a hinged three (3) point latched door with locking handle.

1.5.4.1 Panel is to be set on painted galvanized, aluminum or stainless steel legs mounted to a concrete base, with conduit stubs to enter at the bottom of the panel, and to be set in the concrete base for support.

1.5.4.2 Any deviation must have FCPW approval.

1.5.4.3 All enclosures as well as all switches and indicator lights, whether mounted on an inner door or face of the enclosure, shall be provided with a label that conforms to U.L. descriptions and procedures.

1.5.5 Control panels shall be a lockable deadfront type to provide protection against unauthorized access and vandalism.

1.5.6 No conduit runs or junction boxes are to be installed inside or on top of the wet well. Splicing of cables inside the wet well will not be permitted.

1.5.7 All electrical and control panels shall be provided with an awning to allow access during inclement weather.

1.5.7.1 The width of the awning shall be five (5) feet or the same as the concrete pad whichever is greater.

1.5.7.2 The length of the awning shall be determined by the total length of electrical and control panels.

1.5.7.3 The awning shall be eight (8) feet high.

1.5.7.4 The front side shall be supported by four vertical supports and the back side shall be supported by four vertical supports.

1.5.7.5 Eight (8) inch to ten (10) inch base plates shall be installed on vertical supports.

1.5.8 Enclosure materials

1.5.8.1 Indoor, wet and/or corrosive process areas: 316 Stainless steel, NEMA Type 4X.

1.5.8.2 Indoor, dry, non-corrosive process areas and electrical rooms: Mile steel with epoxy coating, NEMA Type 12.

1.5.8.3 Outdoors – 316 Stainless Steel, NEMA Type 4X.

1.6 Supporting Materials

1.6.1 Indoor, process areas: Stainless steel with stainless steel straps and hardware.

1.6.2 Indoor, finished areas: Galvanized or painted steel with corrosion resistant hardware.

1.6.3 Outdoors: Stainless steel with stainless steel straps and hardware.

1.7 Grounding electrode system:

1.7.1 A grounding system shall be installed as per the National Electrical Code, local codes and ordinances.

1.7.2 An underground perimeter cable grounding system shall be installed with connections to at least the following equipment:

1.7.2.1 Wet well cover.

1.7.2.2 Vault cover.

1.7.2.3 Control panel mounting rack.

1.7.2.4 Main disconnect switch.

1.7.2.5 Pump station fence.

1.7.3 Bare copper wire (#4) is to be connected to the wet well cover and the valve and meter vault cover by way of an approved mechanical connection.

1.7.3.1 Wire (#4) shall also be poured into top slab of the wet well and the valve and meter vault at the foundry with a twelve (12) inch stub-out for field connection.

1.7.3.2 Under no circumstances shall wire be allowed to run across the outside top slabs.

1.8 Power

1.8.1 Each pump and motor unit shall be provided with a separate electrical supply, motor starter, alarm sensors as well as electrical and instrumentation/control systems and components.

1.8.1.1 Electrical and instrumentation/control systems and components shall be located such that they may be disconnected from outside the wet well.

1.8.1.2 Cables and conduits

A. Shall be provided with seals that are both water-tight and gas-tight.

B. Shall be protected from corrosion.

C. Shall allow separate strain relief.

1.8.2 Three-phase power shall be provided for all pumps.

1.8.2.1 No phase converters or single-phase power will be allowed.

1.8.2.2 The standard power source shall be 480V.

1.8.2.3 Lower voltages (240V) only allowed if 480V is not possible and must be approved by FCPW.

1.8.3 A main circuit breaker shall be used.

1.8.3.1 A fused main disconnect shall not be allowed on the main power feed.

1.8.3.2 The main circuit breaker shall meet the following requirements:

A. Be of a type that can be locked in both On and Off positions.

B. The switch shall be U.L. listed for service entrance.

C. The enclosure material shall be as specified in Section 7, Paragraph 1.5 and shall have a lockable cover

D. The enclosure shall be NEMA 12 Indoor and NEMA 4X outdoor. The breaker may be installed within the MCC if used.

E. The switch must be mounted in a secure area at a designated location in the station.

F. Breaker shall have Long, Short, and Instantaneous (LSI) adjustment and ground fault protection as required by the NEC.

1.9 Equipment Starters and Drives

1.9.1 For Pumps less than 20 HP

1.9.1.1 Use soft starters.

1.9.1.2 Must have soft stop capability.

1.9.1.3 Must include integral bypass contactor.

1.9.2 For Pumps greater than or equal to 20 HP

1.9.2.1 Use variable frequency drives.

A. VFD shall be rated for 122º F.

B. Provide in-line harmonic filter which shall comply with IEEE 519 and provide THD less than 5%.

C. Must include integral bypass contactor.

1.9.2.2 Manufacturers

A. Amtech

B. Schneider

C. Danfoss

D. FCPW approved equal

1.10 Main Service Surge Suppressor

1.10.1 A surge suppressor shall be provided at the power service entrance coupled to the main service disconnect switch.

1.10.2 The surge suppressor shall have voltage characteristics to match the power service.

1.10.2.1 The surge suppressor shall provide line to line, line to neutral, line to ground and neutral to ground protection modes as applicable for the power service.

1.10.2.2 The surge suppressor shall be U.L. listed and labeled under UL1449 and UL1283.

1.10.3 The surge suppressor shall be in a NEMA 4X Stainless Steel enclosure.

1.10.4 The surge suppressor shall be provided with a disconnect.

1.10.5 Minimum surge current rating shall be 100-KA per mode and 200-KA per phase per NEMA LS-1.

1.10.6 The surge suppression system shall be duty cycle tested to survive 20-KV, 10-KA, IEEE C62.41 category surge current with less than five percent (5%) degradation of clamping voltage.

1.10.7 The surge suppressor shall have minimum repetitive surge capacity of two thousand five hundred (2,500) impulses per mode and five thousand (5,000) impulses per phase.

1.10.8 Status indicating lights and form “C” dry alarm contacts shall be provided.

1.11 Phase Monitor

1.11.1 A phase monitor shall be provided.

1.11.2 The pump operation shall be inhibited when an open phase/phase reversal condition is detected.

1.11.3 A contact of the phase monitor shall be wired to the PLC for remote indication of the open phase/phase reversal condition.

1.12 Prior to any pump station approval, Developer shall request the appropriate power company to have 3-phase power installed to the site.

1.13 Single-phase motors will not be allowed

PART 2 GENERATOR REQUIREMENTS

2.1 General Requirements

2.1.1 All pump stations are required to have continuous standby power to power the full load of the station regardless of flow storage capacity.

2.1.2 The pump station shall be connected to an automatically activated stand-by power generation source with automatic transfer switch and reset.

2.1.3 Design and installation of the continuous standby power shall conform to the requirements of NFPA 110, NFPA 30, NFPA 37 and all other applicable codes and ordnances.

2.1.4 The engine generator set shall be a factory-assembled unit that is a standard production model with existing torsional analysis data.

2.1.4.1 Mixing and matching engine and generator by a third-party supplier is not acceptable.

2.1.4.2 The engine and generator shall be directly connected with a flexible coupling and shall be free from injurious torsional or other vibration

2.1.5 Generators 125 KW and less are to be installed to operate on natural gas if available. Otherwise, diesel fuel may be used.

2.1.5.1 All gas piping and connecting equipment shall be installed in accordance with the Georgia State Amendments to the Standard Gas Code, latest edition.

2.1.5.2 All gas supply lines must include a drip loop as well as all other equipment required for a safe and complete hook-up.

2.1.5.3 All conduits and gas lines shall be installed underground.

2.1.5.4 If gas is unavailable, a letter of exception must be obtained from FCPW.

2.1.5.5 Developer shall coordinate with the natural gas utility company for appropriate gas meter size based on peak gas generator consumption.

2.1.5.6 Provide gas pressure sensor for pressure monitoring.

2.1.6 Generators above 125 KW shall be diesel powered with 100 gallons minimum fuel storage capacity or 72-hour operating time, whichever is greater.

2.1.6.1 Fuel storage shall be accomplished by the use of corrosion–resistant double wall sub-base fuel tank only. No underground storage will be allowed.

2.1.6.2 A leak detection device shall be provided in the interstitial space for sensing fuel leakage.

2.1.6.3 Provide fuel tank level signal.

2.1.6.4 Contacts for the above devices shall be connected to the generator control panel terminals for telemetry.

2.1.6.5 The diesel engine generator set shall be bermed and shall be designed to contain 110% of fuel tank volume. Berm volume calculations shall be shown on pump station submittal drawings.

2.1.6.6 Each generator shall be furnished with a FCPW approved High Hazard, A 4-A:60-B:C rated, rechargeable fire extinguisher suitable for industrial facilities with processes involving flammable liquids/gas. Class A-B-C.

2.1.7 Acceptable standby power generator manufacturer:

2.1.7.1 Cummins

2.1.7.2 Generac

2.1.7.3 Caterpillar

2.1.7.4 Kohler

2.1.7.5 Onan

2.1.7.6 FCPW approved equal

2.1.8 A one (1) year, from the date of commissioning, comprehensive warranty shall be provided by the manufacturer to include parts and labor.

2.1.9 Generators shall meet all applicable, current U.S. Environmental Protection Agency (USEPA) air emission standards.

2.1.10 Generators shall be supplied with all auxiliary systems necessary for operation (i.e. batteries, battery charger, block heater, etc.) installed.

2.1.11 Generators shall be properly grounded. A generator ground grid must be provided. Design of the grounding system shall comply with NEC, IEEE and all other applicable codes and ordnances

2.1.12 All generators shall be equipped with the quiet run package, including sound attenuating weather enclosure and critical grade muffler.

2.1.12.1 The generator shall be housed in a weatherproof enclosure. Quiet site soundproofing shall be capable to reduce noise to sixty (60) db at a distance of 23 feet from the generator, or at fence line if generator is less than 23 feet from fence.

2.1.13 Generators shall be capable of powering the pump motors' starting current, electrical systems, instrumentation/controls and alarm systems and other auxiliary equipment as may be necessary to provide for the safe and effective operation of the pump station.

2.1.13.1 Generators shall have the appropriate power rating to start and continuously operate under any connected loads.

2.1.13.2 Generators shall be provided with special sequencing controls to delay lead and lag pump starts. Pumps shall start with a minimum 15 seconds lag time. Simultaneous starting of two (2) pumps shall be prevented.

2.1.13.3 A connection shall be provided so that the generator can power an external, portable load bank for maintenance purposes.

2.1.14 Voltage regulation for step load from no load to rated load shall be within +/- four percent (4%) of rated voltage for units up to and including twenty five (25) kW and within +/- 5 percent (5%) of rated voltage for units rated thirty (30) kW or higher.

2.1.14.1 Voltage variation shall be within +/- 1 percent (1%) of the mean value for constant loads, from no load to rated load.

2.2 Generators shall be protected from operating conditions that would result in damage.

2.2.1 Generators shall be capable of shutting down and activating the audible and visual alarms and telemetry if a damaging operating condition develops.

2.2.2 Individual dry contacts shall be provided at the generator via optional relay output board to be used for connection to the PLC.

2.2.3 Contacts must be provided to remotely indicate the following:

2.2.3.1 Generator running

2.2.3.2 Generator fault

2.2.3.3 Generator warning

2.2.3.4 Low fuel level

2.2.3.5 Low gas pressure for natural gas generators

2.2.3.6 Overrun condition

2.2.3.7 High engine temp

2.2.3.8 Low engine temp

2.2.3.9 Low coolant

2.2.3.10 Low oil pressure

2.2.3.11 Fuel tank rupture basin alarm

2.2.3.12 Not in auto

2.2.4 Generators shall be protected from damage when restoration of the power supply occurs.

2.2.5 The generating unit shall be adequately ventilated.

2.2.6 The housing shall have hinged side access doors and a rear control door. All doors shall be lockable.

2.2.7 All sheet metal shall be primed for corrosion protection and finish painted with the manufacturer’s standard color.

2.2.8 Enclosure shall be rated for 150 mph winds

2.2.9 Enclosure shall be provided with intrusion detection switches to be wired into SCADA.

2.2.10 The generator must be mounted far enough away from obstructions to allow all doors to be fully opened.

2.2.11 Vibration isolators as recommended by the generator set manufacturer shall be provided.

2.2.12 Three complete sets of operation and maintenance manuals, two hard copies and one searchable electronic copy, are to be provided to FCPW for the generator and automatic transfer switch.

2.2.13 Generators shall be load tested at 100% full load on site for a period of four hours using resistive load banks. Notify FCPW Inspector prior to test and provide certification letter from the manufacturer.

2.2.14 A demonstration that the generator is capable of providing the required power with all installed pumps operating simultaneously shall be performed at the time of startup.

2.2.15 Generators shall be placed on a reinforced concrete pad to be designed by Developer's Design Engineer based on the specific generator selected. The generator pad is depicted in Standard Detail P-009, in Appendix B.

2.3 Control System

2.3.1 Generator control system shall include a programmable control device to allow automatic start-up and test functions.

2.3.2 Test functions shall be programmable for daily, weekly or monthly testing.

2.3.3 Connections for remote monitoring of function and failure shall be provided.

2.4 Automatic Transfer Switch

2.4.1 The standby power system shall include an automatic transfer switch to automatically start the generator in the following events:

2.4.1.1 Loss of any phase of power

2.4.1.2 Reverse power

2.4.1.3 Low voltage brownout.

2.4.2 The stand by power transfer switch shall not engage until after thirty (30) seconds of continuous power loss or low voltage, occurs.

2.4.3 Automatic transfer switch shall be rate for 100% of full load.

2.4.4 The transfer switch shall be selectable for load or no load.

2.4.5 The transfer switch shall be provided with three phase voltage and frequency sensors with adjustable settings.

2.4.6 Exercise clock shall be provided as a configurable function.

2.4.7 The transfer switch shall be provided with indicators for all phases of operation and be equipped with a fully programmable timer for exercising the equipment.

2.4.8 The automatic transfer switch shall be configured to switch back when power is restored to the pump station.

2.4.9 Automatic transfer switches shall be in a NEMA 4X Stainless Steel enclosure.

2.4.10 Acceptable Transfer Switch manufacturers

2.4.10.1 ASCO

2.4.10.2 Onan

2.4.10.3 FCPW approved equal

2.4.10.4 ATS supplied with the generator as a package by the generator manufacturer shall be as approved by FCPW.

2.4.11 Individual dry contacts shall be provided at the transfer switch via an optional Onan relay output board to be used for connection to the PLC.

2.4.12 A schematic depicting the transfer switch and generator run alarm is provided in Standard Detail P-022, Appendix B.

2.4.13 The control shall provide time delay functions for the following:

2.4.13.1 “Engine Start”

2.4.13.2 “Normal to Emergency Transfer”

2.4.13.3 “Retransfer Emergency to normal”

2.4.13.4 “Genset Stop”

2.4.13.5 “Programmed Transition”

2.4.14 Transfer switch position shall be monitored by the PLC.

2.4.15 Contacts shall be provided to remotely indicate the following:

2.4.15.1 Source 1 available

2.4.15.2 Source 1 connected

2.4.15.3 Source 2 available

2.4.15.4 Source 2 connected

2.4.15.5 Transfer switch Normal position

2.4.15.6 Transfer switch Emergency position

2.4.15.7 AC Line failure

2.4.15.8 High battery voltage

2.4.15.9 Low battery voltage

2.5 Pump Station Controls Electrical Requirements

2.5.1 Developer shall furnish and install one and one-quarter (1-¼) inch conduit connecting the pump station control panel to the generator transfer switch and to the generator control panel.

2.5.2 Developer shall install two (2) ten (10) conductor shielded cables in the one and one-quarter (1-¼) inch conduit to the generator and one (1) ten (10) conductor shielded cable in the one and one- quarter (1-¼) inch conduit to the transfer switch.

2.5.3 The ten (10) conductor cables shall be installed with eight (8) feet of slack in the pump station control pane and four (4) feet of slack in the generator and transfer switch panels.

PART 3 NATIONAL FIRE PROTECTION ASSOCIATION (NFPA) REQUIREMENTS

3.1 Applicable Requirements

3.1.1 The design and construction of the pump station shall comply with all requirements of NFPA 820 – Fire Protection in Wastewater Treatment and Collection Facilities.

3.1.2 At a minimum, the Developer's Design Engineer shall identify all areas with hazardous classifications on the submittal plans and any equipment within those areas requiring special features for being located in a hazardous area.

3.2 Interpretation of Code

3.2.1 When there is a question as to whether a portion of the code is applicable, FCPW shall have the final judgment as to the meaning of the code. Developer and its Design Engineer shall comply with the interpretation of the code as instructed by FCPW.

SECTION 8

INSTRUMENTATION & CONTROL GUIDELINES

PART 1 GENERAL

1.1 The pump station shall be supplied with dedicated pump station control panel(s) (PSCP.)

1.1.1 The PSCP may not house the pump VFDs and protection equipment.

1.1.2 Electrical and controls systems shall have separate panels.

1.2 Dry-pit pump stations shall have a dedicated Motor Control Center (MCC).

1.3 All work and materials shall comply with the National Electrical Code and applicable local regulations and ordinances.

1.3.1 Where required by applicable codes, cabinet assemblies, materials and equipment shall be approved, identified, labeled or listed by Underwriters' Laboratories.

1.4 The cabinet shall be designed to absorb vibrations or mechanical movement from the motor starters or other active equipment.

1.4.1 These movements shall not cause undue vibrations in the control panel.

1.4.2 As a minimum any size 3 or greater starters shall include additional stiffeners or other vibration dampening equipment.

PART 2 COMMUNICATION METHOD

2.1 Site Survey

2.1.1 The Pump Station Control Panel (PSCP) shall be evaluated for communication by Developer. Using the actual location and finished floor elevation of the PSCP location, Developer shall conduct a site survey to determine the Received Signal Strength Indicator (RSSI) (ideal value of -85 dBm to -100 dBm) on 5G Modems or most current compatible technology using the carrier as chosen by FCPW.

2.1.2 The results of the site survey shall be submitted to FCPW for determination of the feasibility of cellular communication at the pump station site. After the conclusion of the field site survey, FCPW will make a determination if cellular communication is feasible.

2.1.2.1 If cellular communication is determined to be feasible, Developer shall include a cellular modem, an antenna and other necessary equipment for successful communication with the PSCP.

A. Developer shall supply, install and configure the equipment to achieve satisfactory cellular communication.

B. As a minimum this equipment will include a cellular modem, antenna, antenna cable and antenna surge suppressor.

2.1.2.2 If cellular communication is determined to be unavailable, Developer shall include an Ethernet modem in the panel.

A. The Ethernet modem shall be an Allen Bradley 9300-RADES or as directed by FCPW.

B. A 5G cellular system shall be installed from the system interface to the panel.

2.2 The Pump Station Control Panel (PSCP) shall include means of communication with FCPW pump station SCADA system.

2.2.1 Primary: Mission Control MYDRO 850 or current model as directed by FCPW . Contact FCPW at time of design.

2.2.2 Secondary

2.2.2.1 High speed internet

2.2.2.2 Cellular.

2.2.2.3 As determined by availabilities at the station site.

PART 3 CONTROL SYSTEM

3.1 General Requirements

3.1.1 All equipment furnished under this section shall be selected for its superior quality and intended performance.

3.1.2 Equipment and materials used shall be subject to review and shall comply with the following requirements:

3.1.2.1 Unless specified otherwise, electrical power supply to the instrumentation equipment will be unregulated 120 volts AC at the locations noted on the one-line and functional diagrams.

3.1.2.2 All transmitted electronic analog instrument signals shall be 4-20 mA DC, unless noted otherwise, and shall be linear with the measured variable.

3.1.2.3 Cabinet Construction and Interior Wiring: In accordance with the National Electrical Code (NEC), state and local codes and applicable sections of NEMA, ANSI, UL, and ICEA.

3.1.2.4 PSCP shall include physical barriers inside panel to prevent accidental access between telemetry and pump control areas of the panel.

3.1.2.5 Control panel shall be fabricated at the System Integrator's panel shop. No field fabrication will be allowed.

3.1.2.6 Cabinet shall be built to UL 508 standards and bear UL listing mark stating “LISTED ENCLOSED INDUSTRIAL CONTROL CABINETS”.

3.2 System Responsibility

3.2.1 Developer shall ultimately be responsible for the performance of the System Integrator.

3.2.2 System Integrator (SI):

3.2.2.1 All instrumentation and industrial electronic systems shall be furnished and installed under the supervision of a single SI who is regularly engaged in the design and installation of such systems of similar scope and complexity.

3.2.2.2 Developer is responsible to the FCPW for the performance of all systems.

3.2.2.3 System Integrators who are pre-approved are as follows:

A. Global Control Systems, Smyrna, GA.

B. M/R Systems, Norcross, GA.

C. Southern Flow, Inc., Alpharetta, GA

D. FCPW pre-approved equal.

3.2.3 Where applicable, SI shall coordinate and provide with other suppliers under other sections of the specifications and drawings on the following:

3.2.3.1 Interface requirements.

3.2.3.2 PLC input and output (I/O) requirements.

3.2.3.3 Consistency of instrumentation.

3.2.3.4 PLC communication requirements.

3.2.3.5 Transfer of data.

3.2.3.6 Control requirements.

3.2.3.7 Programming Logic

3.2.4 SI shall coordinate and schedule all required testing and training with the Developer, its Design Engineer and FCPW in a timely manner.

3.2.5 SI shall submit a weekly status report and updated project schedule to the Developer so that Developer can integrate the SI work into the overall project schedule.

3.2.6 SI shall supply all necessary programming and configuration to demonstrate that the mission system is working during the Factory Acceptance Test (FAT).

3.3 Control Cabinets

3.3.1 Enclosure Type

3.3.1.1 Exterior installation: NEMA 4X

3.3.1.2 Interior installation: NEMA 12 (non-hazardous)

3.3.2 Materials

3.3.2.1 Exterior installation: 304 stainless steel.

3.3.2.2 Interior installation: Mild steel.

3.3.3 Doors

3.3.3.1 Rubber-gasketed with continuous hinge.

3.3.3.2 The enclosure shall have a lockable handle on the outside of each door.

3.3.4 Cabinet

3.3.4.1 The cabinet shall be sized to allow access around all the instruments for ease of operation and maintenance.

3.3.4.2 Exterior cabinets shall be powder-coated white.

3.3.4.3 The cabinet shall be designed to prevent overheating of instruments with an ambient air temperature of 122 degrees Fahrenheit with 100% humidity (noncondensing).

3.3.5 Control panel shall be provided with a single dead lockable front door.

3.3.6 If additional space is required to house this equipment the panel depth may be increased or a double door configuration may be utilized.

3.3.7 The control panel shall generally be laid out as shown on Standard Detail P-027, Appendix B.

3.3.8 Power and control devices shall be separated in the cabinet where one cabinet is used for both power and control.

3.3.9 Manufacturers: Hoffman Engineering Co., Saginaw, or Approved equal

3.4 Door Mounted Components

3.4.1 The following items shall be mounted on the interior door of the PSCP:

3.4.1.1 HMI screen.

3.4.1.2 Level element selector switch.

3.4.1.3 ATS remote annunciator.

3.4.1.4 Pump MAS unit (or other manufacturer’s equivalent if used) if not mounted at the pump motor drive cabinet.

3.4.1.5 A six digit non-resettable elapsed time meters for each pump to show individual pump running time to the 1/10th of an hour.

3.5 Control Power Transformers

3.5.1 Control power transformer(s) shall be installed inside the panel in the motor control section.

3.5.2 The transformer shall be sized at 125% of the rated load and rated for machine tool service.

3.6 Cabinet Wiring shall meet the following requirements:

3.6.1 Wires for AC circuits shall be 600 volt, Type THHN stranded conductor copper and shall be sized for the current to be carried, but not smaller than No. 16 AWG.

3.6.2 Wires for analog signal circuits shall be 300 volt stranded copper and shall be twisted shielded pars not smaller than No. 16 AWG.

3.6.3 Wires for other DC circuits shall be 600 volt, Type THHN stranded copper not smaller than No. 16 AWG.

3.6.4 Wiring shall be numbered and tagged at each termination on both ends.

3.6.5 Wiring for special signals such as communications, digital data and multiplexed signals shall use manufacturer's standard cables.

3.6.6 All control wiring shall be stranded.

3.6.7 Restrained by plastic ties or wire management system.

3.6.8 Hinge Wiring: Secure at each end so that bending or twisting will be around longitudinal axis of wire. Protect bend area with sleeve.

3.6.9 Arrange wiring neatly, cut to proper length, and remove surplus wire.

3.6.10 Provide abrasion protection for wire bundles that pass through holes or across edges of sheet metal.

3.6.11 Provide wire labels at both ends of terminated wire.

3.6.12 If cellular communications is deemed to be unavailable, provide one RJ-11 telephone jack in the control panel. Phone wire from telephone interface to jack to be gel filled direct burial cable.

3.7 Compression Clamp Type Terminals

3.7.1 Strip, prepare, and install wires in accordance with terminal manufacturer's recommendations.

3.7.2 Wires installed in a compression screw and clamp, maximum of one for field wires entering enclosure, otherwise maximum of two.

3.7.3 Splicing and tapping of wires allowed only at device terminals or terminal blocks.

3.7.4 Separate analog and DC circuits by at least 6 inches from AC power and control wiring, except at unavoidable crossover points and at device terminations.

3.7.5 Arrange wiring to allow access for testing, removal, and maintenance of circuits and components.

3.7.6 Plastic Wire Duct Fill: Do not exceed manufacturer's recommendations.

3.8 Terminal Blocks

3.8.1 Provide sufficient terminations to accommodate both present and future needs.

3.8.1.1 Wire spare PLC module I/O points to their cabinet's terminal blocks. Provide 300 volt screw clamp compression, dead-front barrier type terminal blocks with current bar providing direct contact with wire between the compression screw and yoke.

3.8.1.2 Provide yoke, current bar and clamping screw constructed of high strength and high conductivity metal. Use yoke that guides all strands of wire into the terminal.

3.8.1.3 Use current bar providing vibration proof connection.

3.8.1.4 Supply terminals that allow connection of wire without any preparation other than stripping.

3.8.1.5 Rail mount individual terminals to create a complete assembly.

3.8.2 Provide terminal constructed such that jumpers can be installed with no loss of space on terminal or rail.

3.8.3 Size all terminal block components to allow insertion of all necessary wire sizes and types.

3.8.4 Supply terminal blocks with marking system allowing the use of UL approved terminal blocks manufactured by Allen Bradley, Cutler Hammer, Phoenix Contacts or approved equal.

3.9 Grounding

3.9.1 Cabinets isolated copper grounding bus for all signal and shield ground connections.

3.9.1.1 This ground bus shall be grounded at a common ground point.

3.9.1.2 The signal grounding system shall meet National Electrical Code requirements.

A. Each analog loop shall be grounded at a single point for the loop. This single point shall be at location of the DC power supply for the loop.

B. Each analog loop shall have its wire shields connected to ground at a single point for the loop.

C. Discrete signals between cabinets shall be dry isolated contacts rated for 5 amps continuous at 120 V AC.

3.10 Network Cables

3.10.1 Network cables shall be as required for a complete and operational system.

3.11 Electrical Transient Protection

3.11.1 General

3.11.1.1 Protect all elements of the PSCP against damage due to electrical transients induced in interconnecting lines by lightning and nearby electrical systems.

3.11.1.2 As a minimum, provide surge suppressors for the following:

A. At any connection at AC power to PSCP.

B. At analog or digital monitoring or controls (DI, DO and AI).

C. Output of DC power supply.

D. Ethernet cables.

3.11.2 Suppressor on 120 V AC Power Supply Connections

3.11.2.1 Construction: First stage high energy metal oxide varistor and second stage bipolar silicon avalanche device separated by series impedance. Grounding wire, stud or terminal provided.

3.11.2.2 Occurrences: Suppressor tested and rated for a minimum of 50 occurrences of IEEE 587 Category B test waveform.

3.11.2.3 Clamping voltages: 350 volts or less for first stage, 210 volts or less for second stage.

3.11.2.4 Response: 5 nanoseconds maximum.

3.11.2.5 Recovery: Automatic.

3.11.2.6 Continuous operation: 5 amps minimum at 130 volts AC for suppressor on power supply for one (1) 4-wire transmitter or receiver, 20 amps minimum otherwise.

3.11.2.7 Temperature range: -20 degrees C to + 85 degrees C.

3.11.2.8 Manufacturers: EDCO HSP-121, Phoenix Contact FSP-1, Schneider Electric TVS120LC, or approved equal.

3.11.3 Suppressor on Analog Signal Lines

3.11.3.1 Construction: First stage high energy metal oxide varistor and second stage bipolar silicon avalanche device separated by series impedance. Grounding wire, stud or terminal provided.

3.11.3.2 Test waveform: Linear 8 microsecond rise in current from zero amps to a peak current value followed by an exponential decay of current reaching for half the peak value in 20 microseconds.

3.11.3.3 Surge rating: Suppressor tested and rated for a minimum of 50 occurrences of 2000 amp peak test waveform.

3.11.3.4 DC clamping voltage: Twenty to forty percent above operating voltage for circuit. Clamping voltage tolerance less than plus or minus 10 percent.

3.11.3.5 Response: 5 nanoseconds.

3.11.3.6 Recovery: Automatic.

3.11.3.7 Maximum loop resistance: 18 ohms per conductor.

3.11.3.8 Temperature range: -20 degrees C to + 85 degrees C.

3.11.3.9 Approved vendor EDCO PC-642 or SRA-64 Series or equal.

3.12 Ethernet Switch

3.12.1 Provide an 8 port Ethernet switch for connection between automation equipment and telemetry connection.

3.12.2 Ports – 8 RJ-45

3.12.2.1 Speed shall be the latest available.

3.12.2.2 10Gbe (auto-sensing; Full Duplex).

3.12.3 Rugged Industrial Design.

3.12.4 DIN-RAIL mounted.

3.12.5 Environmental Specifications: -40° C to 70°C.

3.12.6 Redundant Power Inputs.

3.12.7 Unmanaged Operation.

3.12.8 Status LEDs – Power On, and link/activity

3.12.9 Manufacturer and Model: N-TRON 308TX or equal

3.13 Corrosion Protection

3.13.1 Corrosion-Inhibiting Vapor Capsule

3.13.2 Manufacturers: Northern Instruments; Model Zerust VC, Hoffmann Engineering; Model A- HCI.

3.14 Cabinet Fabrication

3.14.1 Power Distribution within Cabinets

3.14.1.1 One 120 V AC, 60-Hz feeder circuits.

3.14.1.2 Make provisions for feeder circuit conduit entry.

3.14.1.3 Furnish terminal board for termination of wires.

3.14.1.4 Provide 120 VAC Circuit Breaker in each cabinet for incoming AC Power.

3.14.2 Signal Distribution

3.14.2.1 Within Cabinets: 4 to 20 mA dc signals may be distributed as 1 to 5V DC.

3.14.2.2 Outside Cabinets: Isolated 4 to 20 mA DC only.

3.14.2.3 All signal wiring shall be twisted shielded pairs.

3.15 Signal Switching

3.15.1.1 Use dry circuit type relays or switches.

3.15.1.2 No interruption of 4 to 20 mA loops during switching.

3.15.1.3 Switching Transients in Associated Signal Circuit:

3.15.1.4 4 to 20 mA dc Signals: 0.2 mA, maximum.

3.15.1.5 1 to 5V dc Signals: 0.05V, maximum.

3.16 Relays

3.16.1 General

3.16.1.1 Relay Mounting: Plug-in type socket.

3.16.1.2 Relay Enclosure: Furnish dust cover.

3.16.1.3 Socket Type: Screw terminal interface with wiring.

3.16.1.4 Socket Mounting: Rail.

3.16.1.5 Provide hold-down clips.

3.16.2 Signal Switching Relay

3.16.2.1 Type: Dry circuit.

3.16.2.2 Contact Arrangement: 2 Form C contacts.

3.16.2.3 Contact Rating: 10 amps at 28V dc or 120V ac.

3.16.2.4 Contact Material: Gold or silver.

3.16.2.5 Coil Voltage: As noted or shown.

3.16.2.6 Coil Power: 0.9 watts (dc), 1 .2VA (ac).

3.16.2.7 Expected Mechanical Life: 10,000,000 operations.

3.16.2.8 Expected Electrical Life at Rated Load: 100,000 operations.

3.16.2.9 Indication Type: Neon or LED indicator lamp.

3.16.2.10 Seal Type: Hermetically sealed case.

3.16.2.11 Manufacturer: Potter and Brumfield, Allen Bradley, Siemens, Cutler Hammer or approved equal.

3.16.3 Control Circuit Switching Relay, Non-latching

3.16.3.1 Type: Compact general purpose plug-in.

3.16.3.2 Contact Arrangement: 2 Form C contacts.

3.16.3.3 Contact Rating: 10A at 28V dc or 240V ac.

3.16.3.4 Contact Material: Silver cadmium oxide alloy.

3.16.3.5 Coil Voltage: As noted or shown.

3.16.3.6 Coil Power: 1.8 watts (dc), 2.7VA (ac).

3.16.3.7 Expected Mechanical Life: 10,000,000 operations.

3.16.3.8 Expected Electrical Life at Rated Load: 100,000 operations.

3.16.3.9 Indication Type: Neon or LED indicator lamp.

3.16.3.10 Push-to-test button.

3.16.3.11 Manufacturer and Product: Allen Bradley 700-HC14A1 or approved equal.

3.16.4 Control Circuit Switching Relay, Latching

3.16.4.1 Type: Dual coil mechanical latching relay.

3.16.4.2 Contact Arrangement: 2 Form C contacts.

3.16.4.3 Contact Rating: 10A at 28V dc or 120V ac.

3.16.4.4 Contact Material: Silver cadmium oxide alloy.

3.16.4.5 Coil Voltage: As noted or shown.

3.16.4.6 Coil Power: 2.7 watts (dc), 5.3VA (ac).

3.16.4.7 Expected Mechanical Life: 500,000 operations.

3.16.4.8 Expected Electrical Life at Rated Load: 50,000 operations.

3.16.4.9 Manufacturer: Potter and Brumfield, Siemens, Allen Bradley or approved equal

3.17 Power Supplies

3.17.1 Furnish as required power to instruments requiring external DC power, including two-wire transmitters and DC relays. Regulated DC power supplied for instrument loops shall be provided. Power supplies shall be suitable for an input voltage variation of +/- 10 percent, and the supply output shall be fused or short-circuit protected. Output voltage regulation shall be as required by the equipment supplied.

3.17.2 Convert 120V AC, 60-Hz power to DC power of appropriate voltage(s) with sufficient voltage regulation and ripple control to assure that instruments being supplied can operate within their required tolerances.

3.17.3 Provide output over voltage and over current protective devices to protect instruments and power supplies from damage due to power supply or external failure.

3.17.4 Enclosures: Shall be in accordance with the requirements of Paragraph 1.5.8 in Section 7.

3.17.5 Mount such that dissipated heat does not adversely affect other components.

3.17.6 Supply indicating-type fuses for each DC supply line to each individual two-wire transmitter and mount such that fuses can be easily seen and replaced.

3.17.7 Include fused push-to-test circuitry for each push-to-test indicating light.

3.17.8 Provide internal cabinet light. Light shall be LED rated at 1600 lumens minimum and shall be operated by a door switch.

3.17.9 Provide service outlet with a breaker protected 120-volt, 15-amp, GFCI duplex receptacle and weatherproof enclosure on the outside of the “mini power center” box or support.

3.17.10 Uninterruptible Power Supply (UPS)

3.17.10.1 Provide UPS system, sized for 120 minutes backup time under 150% cabinet load (including all Loop-powered instruments).

3.17.10.2 UPS shall be installed in the PSCP.

3.17.10.3 UPS shall be ferro-resonant type and shall include contact outputs for low battery, loss of utility power, and UPS operating.

3.17.10.4 UPS shall contain a network management card capable of communicating status parameters via Ethernet using Simple Network Management Protocol (SNMP).

3.17.10.5 Manufacturers: Allen Bradley 1609-U500NHC or equal.

3.18 Indicating Lights

3.18.1 AC indicating lights shall be the push-to-test transformer type with LED lamps.

3.18.2 They shall be heavy-duty with NEMA rating to match enclosure type.

3.18.3 The escutcheon and lens color shall be as specified.

3.18.4 Unless otherwise specified, indicating lights shall be equipped with colored lenses in accordance with the following schedule:

Control light Colors		
Color	**Function**	**Example**
Red	Run, open valve	Equipment operating, motor running
Green	Ready, closed valve	Equipment ready to run
White	Normal condition	Control power on, status OK
Amber	Abnormal condition	Failure of equipment or abnormal status, fault condition

PART 4 CONTROL EQUIPMENT

4.1 The PSCP shall include an Allen Bradley PLC, associated I/O and a local operator interface.

4.2 System Integrator shall provide PLC & HMI application programming for the pump station PLC and HMI based on FCPW’s operating requirements.

4.3 System Integrator shall setup the software for the pump station including configuring the following for a complete and operational PSCP:

4.3.1 Device ranges.

4.3.2 IP address.

4.3.3 Motor current range.

4.3.4 Wet well level.

4.3.5 Set points.

4.3.6 Other settings.

4.4 Allen Bradley (Control/Micro) Logix PLC

4.4.1 Analog and Discrete I/O modules shall be of the current model and installed as needed

4.5 Allen Bradley Panel View Plus, Automation Direct C-More, or equal. Minimum size 12 inches.

4.6 Communication Module

4.6.1 PLC I/O shall be configured for Modbus communications using RS45.

4.7 Programmable Logic Controller Functional Requirements:

4.7.1 PLC Inputs and Outputs (I/O) are shown in the table below.

4.7.2 Note that the items as listed are typical, not all I/O may be listed or all used.

TYPICAL STATION CONTROL SYSTEM I/O LIST		
ITEMS	**DESCRIPTION**	**I/O**
Pressure Transducer	Level	Analog
Electromagnetic Flow Meter	Flow	Analog
Electromagnetic Flow Meter	Totalizer Reset	Analog
Electromagnetic Totalizer Pulse	Output Signal	Analog
PLC UPS	Fail	Discrete
Generator	Fuel Leak Warning	Discrete
Generator	Running	Discrete
Generator	Summary Fault	Discrete
Generator	Switch Not in Auto Warning	Discrete
Generator	Low Fuel Level Warning	Discrete
Generator	Over speed Shutdown Fault	Discrete
Generator	Pre High Engine Temperature	Discrete
Generator	Low Coolant Level Warning	Discrete
Generator	Pre Low Oil Pressure Warning	Discrete

TYPICAL STATION CONTROL SYSTEM I/O LIST		
ITEMS	**DESCRIPTION**	**I/O**
Generator	Pre High Engine Temperature Warning	Discrete
Generator	Over crank Shutdown Fault	Discrete
Generator	High Engine Temp Fault	Discrete
Generator	Low Oil Pressure Fault	Discrete
Utility	Power Phase Loss	Discrete
Transfer Switch	Source One Available	Discrete
Transfer Switch	Source One Connected	Discrete
Transfer Switch	Source Two Available	Discrete
Transfer Switch	Source Two Connected	Discrete
Transfer Switch	Transfer Switch Normal Position	Discrete
Submersible Pumps	High Level Alarm	Discrete
Submersible Pumps	Low Level Alarm	Discrete
Submersible Pumps	Seal Failure Each Pump	Discrete
Submersible Pumps	Motor Over Temp Each Pump	Discrete
Submersible Pumps	Pump Running Each Pump	Discrete
Submersible Pumps	Not In Auto Each pump	Discrete
Submersible Pumps	Wet Well Level Signal	Analog
Submersible Pumps	Control Panel Phase Monitor	Discrete
Submersible Pumps	Control Panel Surge Suppressor Status	Discrete
Submersible Pumps	Soft Starters Each Pump	Discrete
VFD 1	Common Fault	Discrete
VFD 1	Speed Control	Analog
VFD 2	Common Fault	Discrete
VFD 2	Speed Control	Analog

TYPICAL STATION CONTROL SYSTEM I/O LIST		
ITEMS	**DESCRIPTION**	**I/O**
Camera 1	Entrance Gate	Discrete
Camera 1	Fault	Discrete
Camera 2	Overall Site	Discrete
Camera 2	Fault	Discrete
Odor Control	H2S Discharge	Analog
Odor Control	Control Fan Air Flow	Discrete
Odor Control	ODOR CONTROL FAN RUNNING	Discrete
Odor Control	ODOR CONTROL FAULT	Discrete
PROCESS_INST	Discharge Pressure	Analog
PROCESS_INST	Discharge Pressure high	Analog
PROCESS_INST	PUMP STATION DISCHARGE FLOW	Analog
PROCESS_INST	Suction Pressure	Analog
PROCESS_INST	WET WELL LEVEL ALARM HIGH	Discrete
PROCESS_INST	WET WELL LEVEL ALARM LOW	Discrete
PROCESS_INST	WW Level PRESSURE TRANSDUCER	Analog
PROCESS_INST	WW Level ULTRASONIC	Analog
PUMP	PUMP 1 CALL-TO-RUN	Digital
PUMP	PUMP 1 E-STOP	Digital
PUMP	PUMP 1 FAULT	Digital
PUMP	PUMP 1 IN AUTO	Digital
PUMP	PUMP 1 IN HAND	Digital
PUMP	PUMP 1 MOISTURE HIGH	Digital
PUMP	Pump 1 Motor Current	Analog

TYPICAL STATION CONTROL SYSTEM I/O LIST		
ITEMS	**DESCRIPTION**	**I/O**
PUMP	PUMP 1 RUNNING	Digital
SAFETY	DRY-WELL FLOOD	Digital
SAFETY	Emergency Eyewash	Digital
SAFETY	MAN-DOWN SWITCH	Digital
SAFETY	STATION VENTILATION FAN FLOW LOW	Digital
SAFETY	WET WELL COMBUSTABLE GAS ALARM	Digital
SECURITY	Cabinet Intrusion	Digital
SECURITY	Generator Intrusion	Digital
SECURITY	Site Lights On	Digital
SECURITY	Station Intrusion (Gate Open)	Digital

4.7.3 Provide inputs, outputs functions or operations required to provide a completely operational system.

4.7.4 Note that this list does not show the PLCs diagnostic fault detection points, which are required.

4.8 Developer shall provide all PLCs and associated equipment and cables to form a complete and functional controller with SCADA remote monitoring, control and data logging capability as required for this project.

4.9 Furnish and install all cables for interconnecting all components of the PLC inside the cabinet. These cables shall include cables to network bridge, power supplies and central processing unit.

4.10 Furnish all network cables needed to interface all applicable PLCs with network.

4.11 Exception to this section: Duplex pump stations with reduced voltage starter (soft start) drives may use a dedicated duplex pump controller.

PART 5 CONTROL LOOP DESCRIPTIONS

5.1 Refer To Block Diagrams.

5.2 Wet Well Level

5.2.1 Failure of one redundant continuous level transmitter causes the PLC to use the backup level transmitter.

5.2.2 Failure of PLC will cause control by backup relay logic and will control pumps based on le0vel set points and VFDs will operate at 100% speed when called to run.

5.2.2.1 Backup relay logic shall be able to be tested through HMI.

5.2.3 Level transmitters shall be operator selectable by switch mounted on control panel door and through HMI.

5.3 Pump Operation

5.3.1 Pumps shall start and stop based on wet well level set points.

5.3.1.1 As the flow increases or decreases, the pump speed shall be adjusted to maintain a constant level in the wet well.

5.3.2 On rising wet well level:

5.3.2.1 Lead pump will increase speed to maintain the set point level.

5.3.2.2 If pump is running at maximum speed for an adjustable period of time without maintaining the wet well set point level (wet well level is increasing) the lag pump shall start.

5.3.2.3 The PLC will increase the speed of the lag pump and decrease the speed of the lead pump to both pump's minimum speed (based on pump and system curve, user adjustable.)

5.3.2.4 The PLC will increase speed of both pumps to maintain the wet well level set point.

5.3.2.5 In the event that both lead and lag pumps are running at maximum speed for an adjustable period of time without maintaining the wet well set point level, the PLC will start the standby pump (if provided) and cause the SCADA to generate an alarm.

5.3.3 On falling wet well level:

5.3.3.1 The PLC will reduce the speed of all operating pumps to maintain the wet well set point level.

5.3.3.2 When the minimum speed is reached and the pumps are not able to keep the wet well level from lowering, after an adjustable period of time, the PLC shall turn off pumps in a first on, first off scheme.

5.3.4 Each pump shall be shut down on high moisture or temperature.

5.4 Odor Control

5.4.1 Odor control fan shall run continuously.

5.5 Emergency Power

5.5.1 Automatic transfer switch (ATS) shall monitor utility power.

5.5.2 Upon loss of utility, phase loss or voltage outside of range, ATS will send start signal to generator. ATS will automatically switch from NORMAL to EMERGENCY source.

5.5.3 Upon re-establishment of utility, ATS will automatically transfer to NORMAL.

PART 6 INSTRUMENT SPECIFICATIONS

6.1 Pump station cycles shall be controlled through the use of wastewater level sensing equipment in the wet well. Wastewater levels within the wet well shall be detected through the use of submersible pressure level transducer with backup ultrasonic transducer.

6.2 Wastewater level sensing equipment shall be used to indicate the following levels and operate the pump station correspondingly:

6.2.1 Low-level alarm

6.2.2 Pumps-off

6.2.3 Lead pump-on

6.2.4 Lag pump-on

6.2.5 High-level alarm

6.3 Wastewater level sensing equipment shall be located so as not to be affected by flows entering the wet well or the turbulence created by the suction of the pump. They shall also be installed in an accessible location.

6.4 Submersible Level Transducer

6.4.1 Provide a submersible level transducer for measurement of the wet well water depth.

6.4.2 The transducer shall be of the solid-state head-pressure sensing type, suitable for continuous submergence and operation and shall be installed in accordance with manufacturer's instructions.

6.4.3 The transducer cable shall be of adequate length to reach the transmitter without splicing.

6.4.4 The bottom diaphragm face of the sensor shall be installed at elevation recommended by the manufacturer.

6.4.5 The sensor shall be mounted using a stainless steel cable system.

6.4.6 The level sensing equipment shall be provided with a digital indicating meter to be mounted above grade, adjacent to the wet well.

6.4.7 Output: 4-20 mA

6.4.8 Acceptable Manufacturer:

6.4.8.1 Siemens

6.4.8.2 Endress & Hauser

6.4.8.3 Approved equal.

6.5 Ultrasonic Level Sensor

6.5.1 Type:

6.5.1.1 Microprocessor based ultrasonic level transmitter.

6.5.1.2 Unit shall have input or output filter capability.

6.5.2 Sensor:

6.5.2.1 Sensors shall have minimum 26 foot range and shall be supplied with sufficient cable length for arrangement indicated.

6.5.2.2 Sensor shall have a NEMA 4X (minimum) enclosure.

6.5.2.3 Unit shall be supplied with automatic temperature compensation as required below.

6.5.2.4 Sensor face material shall be Kynar or Teflon as required.

6.5.3 Accuracy:

6.5.3.1 ± 1.0 percent of calibrated range or better for ranges greater than 25-inches (with temperature compensation).

6.5.4 Output: 4-20 mA

6.5.5 Enclosure: NEMA 4X, polycarbonate or fiberglass.

6.5.6 Mounting:

6.5.6.1 Developer shall coordinate mounting to ensure that the sensor is mounted away from walls and other obstructions in accordance with the manufacturer's recommendations.

6.5.6.2 Transmitter flanges, couplings, stanchions, piping, etc. shall be provided as required.

6.5.7 Acceptable Manufacturers:

6.5.7.1 Siemens Milltronics (Hydro-Ranger 200)

6.5.7.2 Endress & Hauser.

6.5.7.3 Approved equal.

6.6 Pressure Transmitter

6.6.1 Pressure elements shall be installed in an isolator ring, Onyx Isolator Ring PSR or equal.

6.7 Magnetic Flow Meter

6.7.1 A properly sized magnetic flow meter shall be installed on the force main inside the valve and meter vault.

6.7.2 System Description

6.7.2.1 System shall consist of all field and panel mounted instrumentation devices as noted, complete with all necessary signal converters, isolators, amplifiers, power supplies and other appurtenances necessary for interfacing with other components.

6.7.2.2 Flow meter must record and totalize in English units.

6.7.2.3 Meter sizing shall take into consideration the current capacity, flow ranges and future capacity of the pump station.

6.7.2.4 Acceptable Manufacturers:

A. Endress & Hauser PROlinr PROMAG 53

B. Krohne Model ENVIROMAG series,

C. Rosemount,

D. ABB Automation

E. FCPW approved equal.

6.7.2.5 The electromagnetic induction flow meter shall generate a voltage linearly proportional to flow for full-scale velocity settings from one to 33 ft/second.

6.7.2.6 Standard accuracy shall be +/- 2% of rate and +/- 2% of full-scale output for all meters.

6.7.2.7 The meters shall meet the following requirements:

A. Connection type: Flanged 150# ANSI

B. Tube Material: 304 SS

C. Liner Material: Polyurethane

D. Electrode Material: Stainless Steel (unless wastewater analyses dictate otherwise)

E. Enclosure Class: NEMA 6P (IP68)

F. Empty Pipe Detection: Yes

G. Fluid: Wastewater

H. Flow Units: US Gallons (Gallons/Minute)

I. Temp (Max/Norm/Min): -5 to +140 F

J. Electronics Mounting: Remote

K. Remote Distance: 650 feet

L. Type Span Adjustment: touch control/local

M. Power Supply: 110 VAC

N. Transmitter Output: 4-20mA and Pulse

O. Transmitter Digital Communication: Profibus

P. Aux. Input: Status input available for totalizer reset

Q. Display: 4 line backlit with 16 digit LCD

6.7.2.8 The flow meter shall be capable of measuring flow bi-directionally.

6.7.2.9 The flow meter shall be totalizer capable for forward, backwards and net (forward and backward) flow.

6.7.2.10 The flow meter shall be capable of displaying instantaneous flow rate as well as net totalizer value locally on its output screen.

6.7.2.11 The flow meter shall provide local operator HMI for configuration of parameters and reading of data not normally displayed of its screen.

6.7.2.12 The flow meter shall have a 10-year warranty and the sensors a 5-year warranty.

6.7.3 A bypass around the flow meter shall be provided for use during meter maintenance and repair.

6.7.3.1 Two (2) isolation valves shall be installed for complete isolation of the flow meter from the system.

6.7.3.2 One (1) on each side of the flow meter.

6.7.4 Flow meters shall have an adequate straight run of pipe both upstream and downstream of the meter in accordance with the manufacturer’s recommendations.

6.7.4.1 Force main shall be straight a distance equal to five (5) times the nominal pipe diameter before and after the flow meter. Follow the manufacturer’s recommendation for proper installation.

6.7.5 The flow meter shall be connected to the telemetry system via the control PLC for off-site monitoring.

6.7.5.1 The totalizers shall be password protectable to prevent unauthorized resetting.

6.7.5.2 The counters shall maintain their accumulated values even with power loss and continue counting when power resumes.

6.7.6 The flow transmitter shall be housed in a rugged, watertight, dust-tight, corrosion resistant (NEMA 4X and IP65) stainless steel enclosure suitable for conduit connections.

6.7.6.1 The enclosure shall include a polycarbonate window for viewing the LCD without opening the enclosure.

6.7.7 Flow transmitter shall be provided with enough cable to be installed remotely as indicated on the drawings.

6.7.8 The flow transmitter shall have a 2-year warranty.

6.8 Float Switches

6.8.1 Float switches are only allowed for high level alarms, *they are not allowed for pump control in any configuration.*

6.9 Air Flow Switch

6.9.1 Air flow switch shall be provided to prove air flow in ducts and have an adjustable trip point with a range from 200 to 1800 FP.

6.10 Combustible Gas Detector

6.10.1 Pump station shall include a combustible gas detector capable of detecting the presence of LEL gases.

6.10.1.1 Instrument Function: Ambient air pollution monitor.

6.10.1.2 Instrument Description: Combustible gas catalytic detector (single-point).

6.10.1.3 Signal Output: A contact for gas level alarm indication and a 4 to 20 mA DC analog signal.

6.10.1.4 General

A. The gas detector system shall consist of a sensor, a transmitter, a relay module and a power supply.

B. The sensor shall be remotely mounted in the area to be monitored.

C. Up to fifty feet of cable shall be permitted between the sensor and the transmitter.

D. The sensor, transmitter and relay module shall share the same power supply.

E. The gas detection system shall have the capability to detect an over-range condition.

1) This condition shall be indicated on the transmitter LCD display and the output shall be locked at the maximum value.

F. All components of the system shall be approved for mounting in Class 1, Division 1, Group D hazardous locations.

G. All components of the system shall also be designed to meet NEMA 4X requirements.

H. All components of the system shall also be capable of operation in an ambient temperature range of -4 to +122 degrees F.

6.10.1.5 Installation

A. The sensor shall be installed in the location accessible by the operator and in clear view of the wet well.

B. The gas detection system shall be installed in accordance with the manufacturer's instructions and the specified functional requirements.

6.10.1.6 Test

A. The combustible gas detector shall be factory tested by the manufacturer prior to shipment.

B. The manufacturer shall provide three certified copies of the test report.

C. After installation, the unit shall be field tested.

6.10.1.7 Cable

A. The signal cable between the sensor and the transmitter shall be provided by the instrument manufacturer.

B. A sufficient length of cable shall be provided for installation of a continuous run between the sensor and the electronics package.

6.10.1.8 Application

A. Unit shall be setup to indicate an alarm at 5% above normal gas levels.

6.10.1.9 Calibration

A. Instrument shall be calibrated onsite using manufacturer’s recommended technique.

6.10.1.10 Approved Manufacturers

A. MSA Ultima

B. Sensidyne Sensalert

C. Approved equal

6.11 Telemetry/SCADA

6.11.1 All pump station must be equipped with a telemetry system.

6.11.2 The telemetry equipment shall be provided and installed by Developer in complete working order.

6.11.3 The telemetry system shall contact personnel capable of initiating a response to a pump station alarm condition twenty-four (24) hours per day, three hundred and sixty-five (365) days per year.

6.11.4 All pump stations shall be equipped with a Mission Communications, or current model and currently FCPW approved device.

6.11.4.1 A schematic of the I/O connections shall be provided and posted on the inside of the enclosure door.

6.11.4.2 RTU connections shall follow the requirements depicted in Standard Details P-020 and P-021, in Appendix B**.**

6.11.4.3 A legend for electrical acronyms and terms is provided in Standard Detail P-019, Appendix B.

6.11.4.4 RTU unit shall be installed inside its own NEMA 4X Stainless Steel enclosure.

6.11.5 Developer is responsible for complete wiring and programming of the PLC and RTU.

6.11.6 Developer shall provide a field Operation and Maintenance Manual for the RTU and Control Equipment.

6.11.7 Human Machine Interface (HMI) Requirements

6.11.7.1 The pump station System Integrator shall provide complete HMI. Developer shall assume all the associated cost.

6.11.8 Relays

6.11.8.1 Relays to be included in pump station control/operation:

A. Generator Operation

B. Power Failure

C. Pump One Failure

D. Pump Two Failure

E. High Water Level Alarm

F. Flow Meter Output

G. Low Level Alarm

6.12 Enclosures

6.12.1 Refer to Section 7, Paragraph 1.5

6.13 Instrumentation and Controls

6.13.1 Components

6.13.1.1 All conduit work shall be in accordance with the Electrical Conduit and Accessories Specifications for the Fulton County Wastewater Treatment and Collection System, provided in Appendix A.

A. A depiction of the control panel cables is provided in Standard Detail P-016, Appendix B.

B. Once wiring is installed, conduits shall be insulated (sealed) at each end - at the wet well and the enclosures. This will prevent moisture transfer from the wet well into the electrical and control panel enclosures.

C. Conduits shall be Red2hot with PVC coating on the inside throughout the entire length.

6.13.1.2 A phase monitor shall be provided in the pump control panel.

A. The pump operation shall be inhibited when an open phase/phase reversal condition is detected.

6.13.1.3 Control Panel layout to be determined by I&C Specialist and shall be consistent among all new pumping stations.

A.

6.13.1.4 Allen-Bradley Programmable Controller shall be used to control and monitor all pump station functions.

A. PLC to be connected to RS45 MODBUS protocol connection per Mission availability.

B. Example pump station control block diagrams are provided in Standard Detail P-024, 240V, and Standard Detail P-026, 480V, Appendix B.

6.13.1.5 Allen-Bradley PanelView Plus panel mounted human-machine interface (HMI) connected to the PLC shall be used to set pump control parameters and to monitor pump station status. A lockable cover shall be provided to protect the HMI from vandals.

6.13.1.6 I/O (Input/Output) modules shall be provided to monitor and control all pump station equipment in accordance with the I/O list in “Station Control I/O List” table above.

A. Equipment located outside of the pump control panel (generator, transfer switch, flow meter and pressure gauge) shall route telemetry data to/from the pump station control panel PLC for integration with the telemetry system.

6.13.1.7 Pump Soft Starts shall be used for pumps less than 20 HP with piping systems that see a large elevation difference or pressure surge greater than the pipe design pressure when the pump is turned on. This may occur when only one pumping station is providing flow to a force main.

6.13.1.8 Pumps 20 HP or larger shall use VFDs.

6.13.1.9 All pump control components including PLC, phase monitor and HMI shall be installed in a single NEMA 4X Stainless Steel enclosure.

6.13.1.10 Controls and instrumentation circuitry shall be separated from the pump motor starters.

6.13.1.11 Each pump installed at the pump station shall be provided with a "Hand-Off-Auto" selector switch so that the operational mode of the pump may be selected.

6.13.1.12 Each pump installed at the pump station shall have a pump run timer that is capable of keeping a cumulative log of the operational time of each pump. Timers shall be factory installed six (6) digit non-resettable elapsed time meters to show individual pump running time to the one-tenth (1/10th) of an hour.

6.13.1.13 Sufficient indicator lights shall be used to demonstrate the operational status of the pump station.

A. The indication lights shall be specific to the condition detected.

B. At a minimum, indicator lights shall be provided for each pump to indicate a pump-on condition and a pump alarm/failure condition.

C. Paragraph 3.18 of this Section for further details.

6.13.1.14 Sufficient 110-volt electrical receptacles shall be provided to facilitate maintenance at the pump station.

A. If located in an outdoor area, the receptacles shall be of the ground fault interruptible type and shall be protected from the weather elements.

6.13.1.15 Phase converter, when utilized, shall be stationary type Duo Add-A-Phase, manufactured by Ronk Electrical Industries, distributed by IMS, Mayer Electric, Hughes Supply and Rexel Southern Supply.

6.13.1.16 Control Panel Wiring

A. All power wire shall be stranded copper and sized as required for load and application according to the National Electric Code (NEC).

B. Electrical work shall be in accordance with the latest edition of the NEC and subject to all codes.

C. All control and signal wire shall be a minimum of #16 AWG, 90 degree insulated and color-coded.

1) Red for all AC control.

2) Blue for all DC source voltage.

3) Gray for all DC return, orange for all DC control.

4) Yellow for external source control.

5) White for AC neutral.

6) Green for equipment ground wiring.

D. All wiring on the rear of the inner door shall be neatly bundled using tie wraps or other means.

E. All internal wiring on the backplate shall be neatly routed in wire duct with removable covers.

F. All wiring shall be continuous point-to-point (no splices) and be totally accessible with permanent number marking on each end to match the control schematic drawings.

SECTION 9

SITE GUIDELINES

PART 1 PUMP STATION SITE LAYOUT

1.1 An example pump station site layout is provided in Standard Detail P-001, Appendix B.

PART 2 SITE SIZE REQUIREMENTS

2.1 Size of the property to be dedicated to Fulton County for submersible pump stations shall be a minimum of 340 feet by 340 feet minimum in size.

2.2 Dry-pit pump station property sizing or for pump stations requiring special equipment shall be subject to approval by FCPW.

2.3 The area outside the fenced perimeter shall be even sloping grade away from the pump station fence, free of “dips” and “hills” that could impede storm water flow away from the pump station.

2.4 The dedicated pump station property shall not overlap lot lines, detention ponds, drainage easements or other similar elements.

2.5 A twenty (20) foot wide Sanitary Sewer easement must be provided along the length of the force main unless it is located within the right-of-way.

PART 3 SITE ACCESS

3.1 A minimum access easement of 30 feet wide is required for access to the pump station.

3.1.1 This easement can be combined with the 20' wide sewer easement or other utility easement.

3.2 Access Road and Turnaround

3.2.1 An access road and turnaround must be provided for all pump stations.

3.2.2 On all design plans and as-builts, show a separate pump station site plan detail with access road and turnaround.

3.2.3 Developer shall install a concrete walkway from the driveway to the four foot walk through gate.

3.2.4 Access road is to be paved at a twenty (20) foot width minimum.

3.2.5 Turnarounds are to have a forty-five (45) foot turning radius, extending sixty (60) feet from the edge-of pavement of the access road, to provide sufficient room for a vac-jet truck-sized vehicle to turn around.

3.2.6 Driveway and turnaround shall be constructed of concrete.

3.2.7 Concrete access road and turnaround shall be constructed on a six-inch layer of compacted aggregate base course stone.

3.2.7.1 Concrete access road shall be eight (8) inches minimum and have a twenty-eight day (28) compressive strength of three thousand (3,000) psi and be reinforced with Number 5 (#5) rebar spaced twelve (12) inches on center on both the top and bottom faces and in each way as well, i.e. longitudinal and transverse.

3.2.7.2 Pavement design shall consider loading exerted by an eighty thousand (80,000) pound tanker truck.

3.2.7.3 Contraction joints shall be spaced a maximum of fifteen (15) feet in each direction.

3.2.7.4 Expansion joints shall be installed as needed in the access road and turn around.

3.2.7.5 In no case shall uncompacted gravel or stone material be allowed for access road construction.

3.2.8 A cross section of the access road is provided in Standard Detail P-013, Appendix B.

3.2.9 An example of the access road and turnaround are provided in Standard Detail P-012, Appendix B.

3.2.10 If the station property is adjacent to a road, adequate guard rails must be provided to protect the station.

3.2.11 Access road slope shall not exceed 12%.

3.2.12 If the access road is sloped greater than five (5) percent, Developer shall install guard rails and/or bollards to prevent vehicles from rolling off the access road and turnaround.

3.2.12.1 The guard rail/bollards are to be installed maximum five (5) feet from edge of access road and/or turnaround.

3.2.13 The access drive must have adequate line of sight to allow the safe ingress and egress of maintenance vehicles.

3.2.14 Pump station access road subgrade shall be constructed in layers not exceeding six (6) inches in depth and each layer shall be thoroughly compacted to minimum ninety-five percent (95%) of the Modified Proctor maximum dry density as determined by ASTM D1557.

3.2.14.1 This operation shall include any reshaping and wetting required to obtain proper compaction.

3.2.15 All soft or otherwise unsuitable material shall be removed and replace with suitable material.

3.2.16 Protective bollards shall be installed between the edge of the access road and the pump station wet wells and vaults, as necessary, to prevent trucks from driving over the wet well and vaults.

3.2.16.1 Protective Bollards shall be concrete filled 6 inch steel pipe and coated with OSHA Safety Yellow epoxy paint.

3.3 Provide a 20-foot vehicle access rolling gate.

PART 4 GRADING AND DRAINAGE

4.1 Site plan shall show finished grade contour lines at 2-foot intervals in and around pump station and access road.

4.2 Spot elevations shall be provided on station pad and paving to show proper drainage.

4.2.1 No storm runoff/drainage will be allowed to enter the pump station structures.

4.2.2 Storm runoff/drainage shall be diverted away from the pump station during construction.

4.3 Developer shall install a system in front of the gate to divert water away from the station and into storm drain.

4.4 Developer shall not install the pump station within twenty (20) feet of a storm drain catch basin.

4.5 Earth slopes around the pump station created by "fill" that are steeper than 3 to 1 must be stabilized with Juniper or equivalent as approved by FCPW.

4.6 Backfill shall be placed and compacted in 8-inch lifts (maximum) in horizontal layers 8 inches (maximum) in depth.

4.7 All fill shall be compacted minimum to 95% of maximum dry density at not less than 2% below nor more than 2% above the optimum moisture content as determined by ASTM D698.

4.7.1 A minimum of two compaction tests shall be taken at every five feet of backfill around any structure is required.

4.7.2 A certified letter of compaction shall be provided to FCPW's inspector prior to final inspection.

PART 5 SITE UTILITIES

5.1 Site plan shall show all existing and proposed utilities. All utility meters must be properly mounted just inside of the station fence to allow reading without entering the station.

5.2 If gas is required, gas pipe must be buried underground and provided with detection tape wire.

5.3 Electric service to the station shall be run underground.

5.4 Developer shall provide, as separate circuits, two (2) 110 volt 20 amp electrical outlets (receptacles) in industrial metal weather proof boxes.

5.4.1 One outlet shall be located near the pump station jib crane.

5.4.2 The second shall be located on the control panel support frame.

5.5 If potable water is required, a copper potable water service with an acceptable double check valve backflow RPZ prevention device must be provided.

5.5.1 Developer shall be responsible for installing the service line from the water meter to the pump station site and purchasing the three-quarter (3/4) inch meter at his expense.

5.5.2 Water meters shall be set at the right-of-way.

5.5.3 Backflow devices can be located within the station fence or building and be protected from freezing.

5.5.4 Backflow prevention device shall be installed in a hot box with heat tracing wire to prevent freezing.

5.6 A yard hydrant with fifty (50) feet of three-quarter (3/4) inch UV resistant red rubber two hundred and fifty (250) psi commercial grade hose with brass nozzle must be installed with stainless steel hanger.

5.6.1 The yard hydrant shall be a freeze-proof above ground type, Simmons #4802 Yard Hydrant or approved equal.

5.6.2 The yard hydrant shall not be installed directly into the concrete pump station pad.

5.6.3 A one foot diameter, six inch deep, gravel area shall be provided centered on the yard hydrant, see Standard Detail P-004 in Appendix B.

5.7 Developer shall provide eye wash station complete with vacuum breaker attached to the potable water hose connection.

PART 6 SITE SECURITY

6.1 Security

6.1.1 All ports of entry into the pump station facility and structures shall be locked.

6.1.2 Safety placards for all pump station structures and equipment, as required by OSHA, shall be provided and be readily visible.

6.1.3 The gate shall be equipped with an audio and visual alarm connected to the SCADA system.

6.2 Lighting

6.2.1 The pump station facility shall be provided with adequate lighting to facilitate normal and emergency operation and maintenance activities.

6.2.2 Light shall be selected to prevent light trespass.

6.2.2.1 Lighting shall be designed so as not to extent past the pump station.

6.2.3 At a minimum, lighting must provide at the wetwell, control panel and generator.

6.2.4 Area Lighting: Install two (2) 120-volt LED security lights on a twenty (20) foot breakdown pole with automatic eye and pole lowering winch

6.2.5 The light shall be located near the pump station wet well, see Standard Detail P-001 in Appendix B for illustration.

6.2.6 The pole shall be aluminum.

6.2.7 The light shall turn on automatically from dusk to dawn or by motion sensor depending on location. The light pole is depicted in Standard Detail P-006, Appendix B.

6.2.8 Fixture lighting shall be provided as needed. Follow guidelines set in Standard Detail P-006, Appendix B.

6.3 Fencing

6.3.1 All submersible wastewater pumping stations shall be enclosed by a minimum one hundred (100) foot by hundred (100) foot fence and shall be as specified below:

6.3.1.1 Provide a twenty (20) foot wide single rolling gate on six (6) inch diameter posts with a four (4) foot wide walkthrough gate.

6.3.2 Chain link security fences shall be installed as follows:

6.3.2.1 8-foot high.

6.3.2.2 #4 chain link wire fabric with top rails and bottom tension wires.

6.3.2.3 3 strands of barbed wire at the top on angled extension arms.

6.3.2.4 Fence posts shall be set into three (3) feet of concrete and spaced ten (10) feet apart. An example security fence with access gate is presented in Standard Detail P-010, Appendix B.

6.3.2.5 HDPE fence slats and blinds (color to be chosen based on local architecture, with FCPW approval) by TopLock with bottom locking, as directed by FCPW.

6.3.2.6 A two (2) foot chain that can be locked with a #2 Masterlock must be provided. Chain lengths shall be permanently welded to the fence.

6.3.3 Station identification sign

6.3.3.1 The sign shall be as shown in the detail drawings, indicating:

A. Station name and number and address.

B. FCPW and operator.

C. Emergency phone number.

PART 7 PUMP STATION AND SITE AESTHETICS

7.1 Landscaping

7.1.1 Developer shall clear tree limbs or other shrubbery that extends over the fence prior to acceptance.

7.1.2

7.2 Noise Barrier

7.2.1 Noise level shall not exceed 60 dB at 23 feet from generator, or at fence line if generator is less than 23 feet from fence.

7.2.2 A noise wall may be required, in lieu of a privacy fence, depending on the following:

7.2.2.1 Station's proximity to residential area.

7.2.2.2 FCPW discretion.

7.2.3 Materials and Installation

7.2.3.1 Noise barrier material should have a minimum surface weight of 2.2 lbs/ft^2

7.2.3.2 The wall shall be constructed of eight (8) inch thick concrete blocks.

7.2.3.3 The wall shall be painted with outdoor grade paint, color to be chosen based on local prevailing architecture, with FCPW approval.

7.2.3.4 The wall shall be eight (8) feet tall.

7.2.4 A section view of the noise wall is depicted in Standard Detail P-011 in Appendix B.

PART 8 FLOOD PROTECTION

8.1 Pump station structures as well as all associated equipment and appurtenances shall be protected from the one hundred (100) year flood.

8.2 Generator, electrical, instrumentation and odor control equipment shall be protected from five hundred (500) year flood.

8.3 Such protection measures shall ensure that the pump station shall remain fully functional, operational and free from physical damage during a one hundred (100) year flood.

8.4 The pump station shall be protected from inundation of floodwaters by elevating structures at least two (2) feet above and twenty-five (25) feet horizontally away the one hundred (100) year flood elevation.

8.5 The one hundred (100) year flood elevation shall be as identified on the most recent FEMA Flood Insurance Rate map.

8.6 All manholes shall be 3 feet above the base flood elevation.

8.6.1 Manholes installed with top elevations less than 3 feet above the base flood elevation shall be provided with watertight ring and covers.

PART 9 EARTHWORK

9.1 Temporary Sedimentation and Erosion Control

9.1.1 Limitation of Exposure of Erodible Earth:

9.1.1.1 Developer is to provide erosion and/or pollution control measures

A. To prevent contamination of any river, stream, lake, reservoir, canal or other water impoundments

B. To prevent detrimental effects on property outside the project right-of-way or damage to the project.

9.1.2 Use temporary erosion control features to:

9.1.2.1 Correct conditions that develop during construction which were not foreseen at the time of design.

9.1.2.2 Control erosion prior to the time it is practical to construct permanent control features.

9.1.2.3 Provide immediate temporary control of erosion that develops during normal construction operation.

9.1.3 Schedule operations such that the area of unprotected erodible earth exposed at any one time is not larger than the minimum area necessary for efficient construction operations.

9.1.3.1 The duration of exposure of uncompleted construction to the elements shall be as short as practicable.

9.1.4 Acceptable Erosion Control Measures:

9.1.4.1 Temporary Mulching:

A. Furnish and apply a two (2) to four (4) inch thick blanket of straw or hay mulch to areas, as needed, then mix or force the mulch into the top two (2) inches of the soil in order to temporarily control erosion.

B. When beginning permanent grassing operations, plow under temporary mulch materials in conjunction with preparation of the ground.

9.1.4.2 Artificial Coverings:

A. Use artificial coverings composed of natural or synthetic fiber mats, plastic sheeting or netting as protection against erosion during temporary pauses in construction caused by inclement weather or other circumstances. Remove the material when construction resumes.

B. Use artificial coverings as erosion control blankets to facilitate plant growth while permanent grassing is being established.

C. For the purpose described, use non-toxic, biodegradable, natural or synthetic woven fiber mats.

D. Install all sediment control devices in a timely manner to ensure the control of sediment and the protection of lakes, streams or any wetlands associated therewith and to any adjacent property outside the right-of-way as required.

E. At sites where exposure to such sensitive areas is prevalent, complete the installation of any sediment control device prior to the commencement of any earthwork.

9.1.5 Acceptable Sedimentation Control Measures:

9.1.5.1 Sandbags:

A. Furnish and place sandbags in configurations to control erosion and siltation.

9.1.5.2 Berms:

A. Construct temporary earth berms to divert the flow of water from an erodible surface.

9.1.5.3 Baled Hay or Straw:

A. Provide bales having minimum dimensions of fourteen (14) by eighteen (18) by thirty (36) inches at the time of placement.

B. Construct Baled Hay or Straw dams as needed to protect against downstream accumulations of sediment.

9.1.5.4 Temporary Silt Fences:

A. Furnish, install, maintain and remove temporary silt fences, in accordance with the manufacturer's directions.

9.1.5.5 Rock Bags:

9.1.6 Furnish and place rock bags to control erosion and siltation.

9.2 Bedding

9.2.1 Bedding materials shall be in accordance with GDOT Standard Specification Section 812, Type II Foundation Backfill.

9.2.2 The bedding material shall be placed in the bottom of the trench after it has been excavated to an elevation sufficient to permit the placing of not less than six (6) inches or as directed.

9.2.2.1 The surface of the bedding material shall be spread to form a uniform support for the pipe and appurtenances.

9.2.2.2 After installing each section of the pipe, additional bedding material shall be placed on either side of the pipe to an elevation consistent with the bedding type specified herein, as indicated on the plans or specifications or as directed by FCPW.

9.2.2.3 This material is to be well tamped and compacted into place so as to secure a firm, even bearing.

9.2.3 Bedding material shall be placed for the full width of the trench bottom.

SECTION 10
GENERAL CONSTRUCTION GUIDELINES

PART 1 GENERAL CONSTRUCTION REQUIREMENTS

1.1 Locating Existing Utilities

1.1.1 On February 3, 2009, the Georgia Public Service Commission (PSC) approved the adoption of new utility rules 515-9-4-.02 and 515-9-4-.13 under the Georgia Utility Facility Protection Act. These new rules define Large Projects and describe the procedures to be taken should a project meet the specifications of a Large Project. Fulton County requires that the projects submitted for approval by FCPW that meet the criteria set by the PSC for a Large Project follow the procedures set out by the Georgia Utility Facility Protection Act.

1.1.2 Furthermore, FCPW requires that if the project submitted for approval meets the criteria for Large Project status, a utility-locating schedule be submitted with the plans to be approved. This schedule shall describe in detail the FCPW utilities that need to be located and at what phase of the project's completion this field location shall take place. This schedule shall be an individual document in the submittal and shall be submitted at the same time as the project documents. It shall be clearly labeled as the "Locating Schedule for Project Name," where "Project Name" is the name of the project submitted for approval

1.2 Maintenance of Traffic

1.2.1 The Developer is responsible for obtaining all road opening permits, including providing any required restoration bonds.

1.2.2 When a pumping station and/or force main is to be installed within the travel way of a local municipality or GDOT controlled road, a traffic control plan (TCP) shall be required.

1.2.3 The TCP, with the construction plans, shall be submitted to the reviewing agency for review and approval.

1.2.4 The following roadway features shall be shown on the TCP:

1.2.4.1 Pavement Width

1.2.4.2 Pavement Type

1.2.4.3 Speed Limit

1.2.4.4 Traffic Lane Designation

1.2.4.5 Pavement Markings

1.2.4.6 Traffic Signs/Signals

1.2.4.7 Side streets/Intersection Location

1.2.4.8 A TCP shall include the following:

A. Legend

B. Work Hour Restrictions

C. Construction Sequence/Phasing

D. Work Zone Designation

E. Sign Placement

F. Taper Length

G. Traffic Movement Designation

H. Drum/Cone/Barricade/Barrier Placement

I. Flagging Requirement/Location

J. Uniformed Police Officer Requirement/Location

1.2.5 The following agency shall be contacted when preparing a TCP**:**

1.2.5.1 GDOT.

1.2.5.2 Local authorities having jurisdiction.

1.2.6 The following publications govern the design and installation of TCP's and devices:

1.2.6.1 Manual on Uniform Traffic Control Devices (latest edition)

1.2.6.2 GDOT Standard Specifications for Roads and Structures (latest edition)

1.2.6.3 GDOT Roadway Design Manual(latest edition)

1.2.7 FCPW will obtain all road opening permits required by the GDOT.

1.2.7.1 Developer will not permitted to make any type cuts on roadways requiring a permit from the GDOT until such time as the permit is provided and prominently displayed on-site.

1.2.8 All highway utilities and traffic controls are to be maintained and work shall conform to the rules and regulations of the authorities, including the use of standard signs.

1.3 Rock Excavation / Blasting

1.3.1 Rock Excavation

1.3.1.1 Where rock is encountered within excavation for structures, it shall be excavated to the lines and grades indicated on the FCPW approved drawings or as otherwise directed by FCPW.

1.3.1.2 Disposal of Rock: Developer, in a lawful manner shall dispose of rock, off site, that is surplus or not approved by FCPW as suitable for use as riprap or backfill.

1.3.2 Blasting

1.3.2.1 No Blasting shall occur until Developer has received written approval from FCPW. Developer shall notify FCPW in writing the date, time of day of the first blast and the duration the blasting is to occur. Developer shall notify FCPW and local fire department before any charge is set.

1.3.2.2 Developer shall exhaust other practical means of excavating prior to utilizing blasting as a means of excavation. Developer shall provide a blaster certified/licensed in the State of Georgia, and experienced workmen to perform blasting. Developer shall conduct blasting operations in accordance with all existing State and County ordinances and regulations and gain all required permits at its cost. Developer shall protect all buildings, structures and utilities from the effects of the blast. Developer is responsible for any damage due to the blasting and shall repair any resulting or associated damage at its cost.

1.3.2.3 Developer shall employ an independent, qualified specialty subcontractor, to: monitor the blasting by use of a seismograph; identify the areas where charges shall be used; conduct pre-blast and post-blast inspections of structures, including photographs or videos; and maintain a detailed written log that may be reviewed by FCPW.

1.4 Trenching and Excavation

1.4.1 All excavation shall be open cut unless otherwise indicated on the "approved" design or directed by FCPW.

1.4.1.1 In general, topsoil may be removed by machine method.

1.4.1.2 Excavation below topsoil may also be performed by machine, but shall be supplemented by such hand dressing or leveling as may be required to conform to lines and grades as given by FCPW.

1.4.1.3 Material so removed shall be used in backfill, making embankments, filling low area or as otherwise directed.

1.4.2 Hand tool excavation shall be used where necessary to protect existing utilities and structures.

1.4.3 All slopes shall be carefully cut or graded by hand to grades required by FCPW and shall be tamped or otherwise compacted to maintain the material in position.

1.4.4 The final trimming of the bottoms and sides of excavations which is to be adjacent to masonry shall be done just before the concrete is placed or poured.

1.4.5 In open or improved lawn areas, excavation should be done, if possible, utilizing a tractor-mounted backhoe and extreme care should be taken to avoid damage to adjoining lawn areas.

1.4.5.1 In areas not readily accessible by machinery and where excavation is required near existing trees and shrubberies which may be damaged by excavation equipment, the trench shall be excavated using hand tools.

1.4.6 For the minimum width of trench from an elevation of twelve (12) inches above the top of the pipe to the bottom of the trench, refer to Fulton County Standard Detail 103.

1.4.7 Excavation of pipe trenches with sides sloping to the trench bottom will not be permitted.

1.4.8 Should trenches be excavated more than the specified maximum widths, FCPW may require Developer to furnish concrete cradles or concrete encasement for the pipe.

1.5 Sheeting and Shoring

1.5.1 Developer shall be responsible for supporting and maintaining required excavations to the extent of sheeting and shoring the sides and ends of excavations with timber or other supports.

1.5.1.1 If the sheeting, braces, shores, stringers, walling timbers or other supports are not properly placed, or are insufficient, the Developer shall provide additional or stronger supports as may be required.

1.5.1.2 The requirement of sheeting or shoring, or of the addition of supports, shall not relieve Developer his responsibility of their sufficiency.

1.5.2 Trench sheeting shall be left in place until the backfilling has been completed to an elevation not less than twelve (12) inches above the top of the pipe.

1.5.2.1 Unless otherwise ordered by FCPW, sheeting shall be cut off at the top of the lowest set of bracing and the upper section shall be removed.

1.5.3 Where in the opinion of FCPW the removal of sheeting may endanger the work, such sheeting will be ordered to be left in place and the tops cut off as directed or as specified above.

1.5.4 Removal of the sheeting shall be done in such a manner as to prevent injurious caving of the sides. All voids left by the sheeting along trenches shall be carefully filled and rammed with suitable tools.

1.5.5 In quicksand or soft ground, sheeting shall be driven to such depth below the bottom of the trench as directed by the Developer's/Design Engineer. A Professional Engineer Registered in the State of Georgia shall design all sheeting/shoring to meet OSHA standards.

1.6 Removal of Water

1.6.1 Developer shall pump out, or otherwise remove and properly dispose of, any water (e.g. storm water and/or ground water) as quickly as it collects in the excavation.

1.6.1.1 Water shall not accumulate or be present in the excavated trench at any time.

1.6.1.2 This removal is required regardless of the source.

1.6.2 All necessary precautions shall be taken to prevent disturbance at, and to properly drain, any areas upon which concrete is to be poured or upon which pipe is to be laid.

1.6.3 Approved and appropriate equipment with sufficient capacity to remove water from the work shall be kept on site at all times.

1.6.3.1 Equipment shall be used in such a manner as to not withdraw sand or cement from concrete.

1.6.3.2 Developer shall also ensure that removal of any liquids will not interfere with the proper laying of pipe or prosecution of any of the required work for the complete construction of the project.

1.6.4 The flow in sewers, drains, gutters or water courses encountered during the construction shall be adequately provided for by Developer to ensure these flows do not interfere with the prosecution of the work and are maintained in such a manner as to ensure continuity of flow at all times.

1.6.5 Unless otherwise permitted, ground water encountered within the limits of excavation shall be depressed to an elevation not less than twelve (12) inches below the bottom of such excavation.

1.6.5.1 This depression is to be done before pipe laying, precast structure installation or cast-in-place concrete work is started and shall be so maintained until concrete and joint materials have attained initial set.

1.6.6 If raw sewage is encountered during performance of the Work, Developer shall immediately stop work and shall notify FCPW. FCPW will determine whether actions by Developer caused the leak. FCPW mitigation guidelines shall be followed:

1.6.6.1 FCPW will promptly notify the appropriate regulatory agencies if necessary.

1.6.6.2 In addition, FCPW will instruct the Developer as to what actions, if any, Developer can and cannot perform prior to any directives which may be issued by the regulatory agencies.

1.6.6.3 Any sewage shall be pumped and hauled to a manhole, pump station or advanced wastewater facility as directed by FCPW.

1.6.6.4 Any other liquids shall be properly disposed of as directed by FCPW and/or any regulatory agencies having jurisdiction.

1.6.7 If other hazardous liquids or materials, as defined by the Federal, State of Georgia, Fulton County and Local jurisdiction in conjunction with the Comprehensive Environmental Response, Compensation and Liability Act, (CERCLA) and Superfund Amendments and Reauthorization Act (SARA) Title III, are encountered during performance of the Work, Developer shall immediately stop work and shall notify the appropriate State agency and FCPW.

1.6.7.1 Hazardous liquids include, but are not limited to gasoline, diesel fuel and industrial solvents or cleaners.

1.6.7.2 The Federal, State of Georgia, Fulton County and/or Local jurisdiction(s) in conjunction with FCPW, will then determine whether actions by Developer caused the liquids or materials to leak or further dispersed.

1.6.7.3 Any hazardous liquids or materials shall be properly disposed of as directed by the Federal, State of Georgia, Fulton County and/or Local jurisdiction(s) in conjunction with FCPW.

1.7 Pipe Handling

1.7.1 Developer shall unload all pipe, fittings, and accessories from trucks with hoists or by skidding.

1.7.1.1 Pipe handled on skidways shall not be subjected to skidding or rolling against pipe already on the ground.

1.7.1.2 Under no circumstances shall said materials be dropped off any delivery vehicle.

1.7.1.3 Should any material be accidentally dropped, it shall be immediately labeled with indelible markings or tagged and set aside, or rejected as directed by FCPW.

1.7.1.4 If FCPW has any questions regarding acceptability of said materials, Developer shall either remove and replace the questionable materials or obtain a signed written statement from the manufacturer certifying the pipe, fittings and/or accessories as "undamaged"

1.7.2 Developer shall use proper, suitable tools and appliances for the safe and convenient handling and laying of pipe and fittings. Developer shall take great care to prevent the coating and lining from being damaged.

1.7.3 Pipe shall not be "strung", or laid out, along the project within existing highway rights-of-way, unless specifically directed to do so by FCPW, and only then after receiving permission from the road authority that has jurisdiction.

1.7.4 Pipe shall be stored in such a manner as to keep the interior free of dirt and other foreign matter.

1.7.5 Developer shall carefully examine the pipe and fittings for defects just before laying.

1.7.5.1 No pipe or fitting that is known to be defective shall be laid.

1.7.5.2 In the event that defective pipe or fittings are discovered after having been laid, Developer shall remove and replace with sound pipe or fittings in a manner satisfactory to and at no addition cost to FCPW.

1.7.6 Developer shall maintain a clean Work site and clean materials throughout the project. Pipe and fittings shall be kept free from mud, dirt and debris while stored onsite and shall be thoroughly cleaned before being laid.

1.7.6.1 During any stoppage in the laying of pipe and when ending construction for the day, Developer shall install a mechanical or fitted plug in the open end of the pipe to prevent contamination of the pipeline.

1.7.6.2 Should any accidental contamination occur, the pipe shall be thoroughly cleaned and swabbed out and inspected by FCPW before new or further pipe installation can commence.

1.8 Pipe Laying

1.8.1 A minimum burial depth of four (4) feet (within the fence line) and five (5) feet (outside the fence line) as measured from the crown of the pipe to the ground surface shall be provided.

1.8.2 All pipes shall be thoroughly cleaned before being laid and shall be kept clean until final acceptance of the Work.

1.8.3 The pipe shall be laid and jointed in the following manner:

1.8.3.1 Clean Ring and Spigot – The gasket, groove, and pipe spigot shall be wiped clean of foreign material.

1.8.3.2 Install Gasket – The ring shall be inserted in the groove, taking care to see that the gasket is evenly seated and free from twists.

1.8.3.3 Apply Lubricant –The spigot end of the pipe from the pipe end to the full insertion mark shall be lubricated. Only the lubricant approved by the manufacturer shall be used. After the spigot end has been lubricated, it shall be kept clean and free of dirt, sand, or embedment material. If foreign matter adheres to the lubricated end, the spigot shall be wiped clean and relubricated.

1.8.3.4 Assembly – After the pipe sections are aligned, the spigot end shall be pushed into the bell or coupling until it hits the stop and/or the reference insertion mark is in the proper location. The recommended assembly method is the use of a bar and a block. Pullers such as a "come along" may also be used if the pipe is protected from the chain or cable. Pipe deflection/offset shall not exceed the values listed in Fulton County Standard Detail 120.

1.9 Bore and Jack for Force Mains

1.9.1 General

1.9.1.1 Working drawings shall show the size and location of bore and jack pits together with the sheeting and shoring to be used.

1.9.1.2 In addition, such drawings shall include large-scale plan and profile of the proposed installation and affected structures if requested by FCPW.

1.9.2 Casing Pipe

1.9.2.1 Casing pipe shall be new and unused pipe.

1.9.2.2 The casing shall be made from steel plate having a minimum yield strength of thirty-six thousand (36,000) psi.

1.9.2.3 The steel plate shall also meet the chemical requirements of ASTM A36, latest edition.

1.9.2.4 At the discretion of FCPW, the outside of the casing pipe shall be coated with epoxy having a minimum dry film thickness of sixteen (16) mils.

1.9.2.5 Surface preparation shall be SSPC-SP-10.

1.9.2.6 Epoxy shall have a minimum solids content of sixty-five (65) percent by volume and shall be air or airless spray applied;

1.9.2.7 Minimum drying time shall be seven days.

1.9.2.8 Brushing shall be permitted in small areas only.

1.9.2.9 All coating and recoating shall be done in strict accordance with the manufacturer's recommendations.

1.9.2.10 Epoxy shall be Tnemec, Carboline or Valspar.

1.9.2.11 The thicknesses of casing shown below are minimum thicknesses.

1.9.2.12 Actual thicknesses shall be determined by the casing installer, based on its evaluation of the required forces to be exerted on the casing when jacking.

1.9.2.13 Any buckling of the casing due to jacking forces shall be repaired at no additional cost to FCPW.

1.9.2.14 The diameters of casings listed below are the minimum to be used.

1.9.2.15 Larger casings, with FCPW's approval, may be provided at no additional cost to FCPW, for whatever reasons Developer may decide, whether casing size availability, line and grade tolerances, soil conditions, etc.

1.9.2.16 For casing sizes, under railroads and highways, and carrier pipe and pipe support installation requirements, refer to Fulton County Standard Detail 107 and 129.

1.9.2.17 Under railroads, Developer shall provide uncoated casings, unless otherwise required.

1.9.2.18 Developer shall supply casing in accordance with the encroachment permits that are issued.

1.9.3 Steel

1.9.3.1 Steel pipe shall be used for bore and jack casing.

1.9.3.2 Pipe shall conform to the latest revisions of ASTM A134 or ASTM A139 with a minimum yield of thirty-five thousand (35,000) PSI. Alloy shall be in accordance with the latest edition of ASTM A36.

1.9.3.3 Casing pipe may be uncoated and unlined with approval by FCPW.

1.9.4 Casing Spacers

1.9.4.1 Casing spacers shall meet one of the following requirements:

A. Casing spacers shall be flanged, bolt-on style with a two-section stainless steel shell lined with a PVC liner,

1) Minimum 0.09-inch thick having a hardness of eighty-five (85) to ninety (90) durometer,

2) Minimum fourteen (14) gauge band and ten (10) gauge risers, with two (2) inch wide glass reinforced polyester insulating skids.

B. Runners shall be attached to stainless steel risers which shall be properly welded to the shell.

C. The height of the runners and risers shall be manufactured such that the pipe does not float within the casing.

1.9.4.2 Casing spacers shall be as manufactured by one of the following:

A. Cascade Waterworks Manufacturing Company

B. Pipeline Seal and Insulator, Inc.

C. Advanced Products and Systems, Inc.

1.9.5 Installation

1.9.5.1 Where pipe is required to be installed under railroads, highways, streets or other facilities by bore and jack method, the operations of Developer shall be subordinate to the free and unobstructed use of highway and structures and shall not weaken the roadbed or structure. Refer to Fulton County Standard Details 107 and 129.

1.9.5.2 Developer shall proceed with the Work in such a manner as shall permit regular transaction of business by the highway department and/or property owners without delay or danger to life or property. Developer shall place necessary barricades, warning signs, signals, lights and, if necessary, watchmen for the protection of the public.

1.9.5.3 Jacks for forcing the casing pipe through the roadbed shall have a jacking head constructed in such a manner as to apply uniform pressure around the ring of the pipe. The pipe to be jacked shall be set on guides, braced together to properly support the section of the pipe and direct it to the proper line and grade. In general, roadbed material shall be excavated just ahead of the pipe.

1.9.5.4 Whenever possible, the pipe shall be jacked from the low or downstream end.

1.9.5.5 Excavated material shall be placed safely near the top of the working pit and disposed of as required. Use of water or other fluids will be permitted only to the extent necessary for lubrication. Jetting shall not be permitted.

1.9.5.6 The diameter of the excavation shall conform to the outside diameter and circumference of the casing pipe as closely as feasible. Any voids that develop during the installation operation shall be pressure grouted.

1.9.5.7 After the steel casing pipe has been installed, the carrier pipe shall be installed in the casing pipe. Care shall be exercised to maintain tight, fully seated joints in the carrier pipe. At each end of the casing pipe, the void between the carrier pipe and casing shall be sealed with casing end caps.

1.9.5.8 When requested by FCPW, either grout shall be pumped between the carrier pipe and steel casing or sand shall be blown into the casing to fill the voids. Alternate methods shall be submitted for approval.

1.9.5.9 All sheeting placed for the jacking/auguring shall be completely removed by Developer. All bore and jack designs shall include a manhole at or near each end of the jacked section.

1.9.5.10 When site conditions dictate, conventional tunneling techniques may be utilized as an alternate to bore and jack.

1.10 Work within GDOT ROW

1.10.1 All roadway restoration shall be done in accordance with the lawful requirements of the authorities within whose jurisdiction such pavement is located.

1.10.2 All highway utilities and traffic controls are to be maintained and work shall conform to the rules and regulations of the authorities including the use of standard signs.

1.10.3 Developer shall furnish all such bonds or checks which may be required by the highway authorities to ensure proper restoration of paved areas.

1.10.4 Trench restoration within a GDOT right-of-way shall be in accordance with GDOT Standard Detail 1401 Pavement Patching Details.

http://mydocs.dot.ga.gov/info/gdotpubs/ConstructionStandardsAndDetails/1401.pdf

1.11 Backfilling

1.11.1 General

1.11.1.1 Backfill material shall be compacted to a density of not less than 95% of the maximum dry density as determined by the standard proctor test ASTM D698 (latest version).

A. When directed, Developer shall arrange to have such compaction tests conducted by an independent testing firm.

B. When directed, Developer, at its expense, shall arrange and bear the burden of the cost to have such compaction tests conducted by an independent testing firm. The minimum number of tests shall be one per 50 LF of pipeline installed and the locations shall be determined by FCPW.

1.11.1.2 Materials used for backfilling shall be free from all perishable organics or other objectionable materials and shall contain no stones larger than three (3) inches in its longest dimension.

1.11.1.3 No soil backfill shall be used in pipe trenches under roadways or other paved areas. In such paved areas, trenches shall be backfilled with crushed rock and compacted to the minimum required compaction of ninety-five percent (95%) of the maximum dry density. When allowed by FCPW, in non–paved areas the compaction may be less than ninety-five percent (95%) however no less than ninety percent (90%) of the maximum dry density.

1.11.1.4 Excavations shall be backfilled with No. 57 stone **orA-1** as directed by FCPW.

1.11.1.5 If, in the opinion of FCPW, the original excavated material is unsuitable for use as backfill, such as perishable matter, refuse, building materials, wire, brush, stumps, ashes, large stones, muck or other soft materials, Developer shall properly dispose of the objectionable materials and shall furnish, haul and place borrow material suitable for proper backfill as directed by FCPW.

1.11.1.6 Backfilling shall not be done in freezing weather, except by permission of FCPW, and shall not be done using frozen materials or upon frozen materials.

1.11.1.7 All backfilling shall be left with smooth, even surfaces, properly graded, and shall be maintained in such condition until final completion and acceptance of the Work, notwithstanding applicable warranty periods.

A. Where directed by FCPW, Developer shall mound the backfill slightly above the adjacent ground to allow for settlement.

1.11.2 Trenches

1.11.2.1 Backfill in trenches where pipe has been laid shall be placed continuously by hand in layers not exceeding six (6) inches in thickness and carefully and thoroughly consolidated by tamping simultaneously on both sides of the pipe to a height of twelve (12) inches above the top of the pipe.

A. This backfilling and compacting must be done promptly and before any backfill material is deposited directly from a machine bucket, loaders, trucks or other mechanical equipment.

B. When utilizing a machine bucket for backfilling, the bucket must be lowered into the trench to deposit the material in such a manner as to avoid the shock of falling earth which could injure or damage the pipe or structure.

C. Under no circumstances should the material be allowed to fall from the machine or loader bucket directly onto the pipe or conduit in the trench.

1.11.2.2 Except as otherwise ordered by FCPW, all forms, bracing and lumber shall be removed from the trench before backfilling.

1.11.2.3 Bottoms of trenches in earth must be shaped or molded and compacted to the contour of the outside of the pipe, using bedding materials, as directed or where indicated on the approved design, to give full support to the lower segment of the pipe.

A. This shall be done in such a manner as to prevent any subsequent settlement of the pipe.

B. Boulders or loose rock which might bear against the pipe will not be permitted in the trench bottom or in the backfill within the first two (2) feet above the top of the pipe.

C. Bottoms of excavations which are of loose granular soils shall be compacted by vibratory compactor prior to laying of pipe to a minimum density of ninety-five percent (95%) of the maximum dry density as determined by the standard proctor test ASTM D698 (latest version).

1.11.2.4 Where foundation conditions are such that proper bedding cannot be provided, such as in quicksand, Developer may be directed by FCPW to provide foundation cushion, concrete cradles or other special provisions to provide support for the pipe.

1.11.2.5 Only after the backfill has been placed and hand-compacted to at least twelve (12) inches above the top of the pipe may the work proceed in the placement of the remaining backfill material, which must be carefully placed and compacted.

A. In streets, other surfaced areas or where directed, the backfill shall be placed and compacted in lifts not to exceed twelve (12) inches in thickness.

B. All precautions must be taken to avoid having any unincorporated material which may result in future settlement in these areas.

C. Compaction shall be accomplished by approved mechanical tampers.

1.12 Abandonment of Pipelines

1.12.1 All lines that are proposed for abandonment shall be approved by the FCPW. Developer shall submit a schedule and detail methods to be used on each pipeline to be abandoned.

1.12.2 Abandoned pipe lines shall be inspected prior to filling.

1.12.3 No abandonment shall proceed until approval issued by FCPW.

1.12.4 Filling abandoned pipelines shall conform to the requirements of the submittal approved by FCPW. Developer shall have a minimum of five (5) years' of documented experience in chemical grouting of pipe lines.

1.12.5 All Sanitary Sewer lines shall be cleaned before CCTV and abandoning. Where indicated on the approved plans or as directed by FCPW, Developer shall perform television inspection, smoke testing and/or dye testing to determine whether there are active service connections on sanitary sewer lines. Developer shall not fill pipe lines with active connections. Each line to be abandoned, at a minimum, shall have a brick bulkhead at each end. Flowable fill shall be pumped into the pipe line from the upstream end with sufficient pressure to ensure that the line is completely filled.

1.13 Flowable Fill

1.13.1 Reference www.dot.ga.gov - in the search engine bar type in - Section 600.

1.13.2 Developer shall follow the minimum requirements of GDOT Section 600 and shall submit a design mix to FCPW for approval.

PART 2 RESTORATION OF PAVEMENTS, SIDEWALK, AND CURBS

2.1 General

2.1.1 Fulton County Standard Detail 109 shall be followed for the repair of concrete and asphaltic concrete surfaces.

2.1.2 Work Included:

2.1.2.1 Developer shall furnish all materials for, and properly restore, all pavements, drives, sidewalks and curbs which may have been damaged, removed or disturbed as a result of accomplishing the Work.

2.1.2.2 Restoration and replacement shall be made to the satisfaction of FCPW. This shall include in general, but without limitation, all necessary concrete, reinforcing steel, stone, cinders, gravel, slag, asphalt or other bituminous material necessary for the proper completion and restoration of the Work as may be required, directed or specified.

2.1.3 Materials and Workmanship

2.1.3.1 Materials to be used in the repair and restoration of pavements, drives, sidewalks and curbs shall be first quality.

2.1.3.2 All materials removed while accomplishing the work shall be disposed by Developer meeting all Federal, State and County laws.

2.1.3.3 No existing material may be reused in the Work unless pre-approved by FCPW.

2.1.3.4 All workmanship shall be first class.

2.1.3.5 Concrete shall be Class B plain concrete with a twenty-eight (28) day compressive strength of three thousand (3,000) psi, unless otherwise specified in the drawings or specifications.

2.2 Restoring Pavements

2.2.1 After the pipe has been laid, appurtenant work constructed and backfill completed, Developer shall furnish, place, restore and maintain all pavements or roadway surfaces which have been removed, or damaged by, in pursuit of the Work.

2.2.1.1 The form and degree of restoration shall be as specified on the approved design, as specified herein and/or as directed by FCPW.

2.2.2 For backfilling roadway cuts, only No. 57 stone backfill shall be used. See Section 9, Paragraph 9.2 for bedding requirements and Section 10, Paragraph 1.11.2 for trench backfill requirements.

2.2.3 All roadway restoration shall be done in accordance with the lawful requirements of the authorities within whose jurisdiction such pavement is located.

2.2.3.1 All highway utilities and traffic controls are to be maintained and work shall conform to the rules and regulations of the authorities, including the use of standard signs.

2.2.3.2 Developer shall furnish all such bonds or checks which may be required by the highway authorities to ensure proper restoration of paved areas.

2.2.4 When removal of pavement is required (other than gravel types) Developer shall outline the area to be removed by making saw-cuts.

2.2.4.1 Saw-cuts shall be vertical to allow the removal of the paving material in straight lines.

2.2.4.2 If pavement breakage occurs beyond the saw-cut, Developer shall make a new straight saw-cut beyond the furthest point of breakage.

2.2.5 The concrete base course shall extend the full width of the trench cut plus a minimum of twelve (12) inches on either side of the trench.

2.2.5.1 The existing pavement shall be neatly sawed along both sides of the ditch. The concrete used shall be Class A or B Concrete.

2.2.5.2 Once the concrete base course has properly set, the concrete surface shall be cleaned and a minimum of one (1) inch thick asphaltic concrete pavement shall be laid to match the level of the adjacent pavement.

2.2.6 At any time that an existing road is cut longitudinally for a distance greater than one hundred (100) feet, the concrete shall be poured flush with existing and the street shall be resurfaced curb to curb with one (1) inch minimum of asphaltic concrete. Existing road shall be restored to preconstruction condition.

2.2.7 Developer shall be responsible for maintaining all pavement cuts prior to project acceptance and during the one-year maintenance period.

2.2.7.1 Should any failures be noted associated with any portion of the Work, Developer shall remove all such damaged surfaces and make full repairs. This includes adding and re-compacting approved backfill materials, placing and maintaining bituminous concrete pavement or stone road surfaces.

2.2.7.2 All required pavement repairs necessitated due to pavement failure, either prior to final project acceptance or during the one-year maintenance period, shall be completed by Developer within five (5) working days of notification by FCPW.

2.2.7.3 Bituminous concrete pavements or stone road surfaces which Developer is required to replace, shall be in at least as good condition at the end of the one-year maintenance period as it was before construction.

2.2.8 Roadway Permits

2.2.8.1 Developer is responsible for obtaining all road opening permits from the local authorities having jurisdiction, including providing any required restoration bonds.

2.2.8.2 FCPW will obtain all road opening permits required by the GDOT.

2.2.8.3 Developer is not permitted to make any type of cuts on roadways requiring a permit from the GDOT until such time as the permit is provided and prominently displayed on-site.

2.3 Restoring Driveway Pavements

2.3.1 Developer shall repair or replace all driveway sections disturbed by the process of the Work.

2.3.2 Driveways shall be constructed of the same materials and to the same thickness of the adjoining wearing surface.

2.3.3 In restoring driveways, the subsoil and foundation material shall meet a minimum of 95% compaction so as to prevent any future settlement or cracking of the driveway pavement.

2.3.4 In restoring concrete driveways, the base course shall be wetted prior to pouring new concrete.

2.3.5 Where necessary to cut a concrete driveway, the cuts shall be made with a masonry saw providing a smooth and straight line completely across the driveway.

2.3.6 Partial cut-outs, crooked cuts or cuts made by any methods other than masonry saw are not permitted.

2.3.7 In general, or where directed, concrete slab removal shall be made in entire pavement sections to the nearest existing expansion joint.

2.4 Restoring Curbs

2.4.1 Developer shall restore all curbs and combination curbs and gutters which have been removed or disturbed in the progress of the Work.

2.4.2 Curbing shall be made to conform accurately in size, line, grade and materials as the adjoining section.

2.4.3 In restoring curbs, the subsoil and foundation material shall meet a minimum of 95% compaction so as to prevent any future settlement of the concrete curbing.

2.4.4 The sub-base shall be thoroughly rolled or tamped and shall be wetted just before the concrete is placed but shall show no pools of water.

2.5 Restoring Sidewalks

2.5.1 Developer shall restore all sidewalks which have been removed or disturbed in the progress of the work.

2.5.2 Sidewalks shall be constructed to the same dimensions and materials as the adjoining sections.

2.5.3 Where necessary to cut a sidewalk, entire sections shall be removed and replaced unless otherwise directed by FCPW.

2.5.4 The sub-base shall be thoroughly rolled or tamped to a minimum of 95% compaction and shall be wetted just before the concrete is placed, but shall show no pools of water.

2.6 Developer's Warranty of Restored Paved Surfaces

2.6.1 Developer shall make every provision to ensure a minimum of 95% compaction under areas to be paved by properly tamping any backfill under areas to be paved.

2.6.2 Any settlement which may occur during the one (1) year warranty period shall be corrected by Developer at his expense. Work shall include removing, re-compacting and replacing any paved surfaces which show signs of settlement whether or not actual damage to the paved surface has occurred.

2.6.3 This shall apply to all paved surfaces including streets, drives, sidewalks and curbs and gutters.

2.6.4 Should settlement, cracks or other indications of failure or impending failure, appear in the paved surface, the adjoining paving shall be removed to the extent necessary to secure a firm, undisturbed bearing.

2.6.5 All removal, re-compaction and replacement shall be in accordance with the specifications concerning these operations as stated elsewhere.

PART 3 SEEDING / SOD REPLACEMENT

3.1 Work Included

3.1.1 Developer shall furnish all labor and materials to properly restore to the satisfaction of FCPW all ground surfaces, irrespective of type, which may have been disturbed in the progress of the Work.

3.1.2 Developer shall refer to the AASHTO “Green Book” for erosion and sedimentation control for additional standards and requirements not listed in these Guidelines.

3.1.3 This shall include in general, but without limitation, the spreading of topsoil, seeding, sod replacement, fertilizing and mulching required to restore disturbed areas as may be necessary, directed or specified herein.

3.1.4 On all "sod" type lawns and other improved, well established grass areas, the sod/grass shall be carefully removed, kept alive, and replaced after the backfilling and grading is finished.

3.1.5 Developer shall also remove all spoil from such areas as quickly as possible after the excavation has been backfilled. Developer shall leave the premises in as good condition as before undertaking the Work.

3.1.6 It is the intent of these Design Guidelines to restore all disturbed areas, to place seed and mulch in areas not specifically identified as improved lawns, to place topsoil and seed where improved lawns existed prior to construction, and to provide for "sod" removal and replacement in areas identified as such prior to construction.

3.2 Standard Specification for Seeding/Sod Replacement

3.2.1 The requirements of the GDOT "Standard Specifications - Construction of Roads and Bridges", Current Edition and as revised to date, shall apply to the extent they are applicable for all seeding/sod replacement as directed by FCPW.

3.3 Topsoil

3.3.1 Where directed by FCPW, area to be seeded shall be covered with a layer of topsoil.

3.3.2 The topsoil shall be of sufficient thickness that when spread and compacted, a minimum of four (4) inches will be available.

3.3.3 Developer shall furnish natural topsoil of good condition and tillable structure.

3.3.4 Obtain topsoil as borrow from an outside source of uniform texture, drainage and other characteristics so as to constitute a homogeneous soil meeting the requirements of GDOT and as approved by FCPW.

3.3.5 Developer shall furnish topsoil that is free from objectionable materials such as hard clods, stiff clay, sods, hardpan, partially disintegrated rock, large roots or other materials that are not integrally a natural component of good agricultural soils and which are harmful or not beneficial for successful plant growth.

3.3.6 Do not use topsoil containing frost or in an excessively wet (muddy) condition.

3.3.7 If utilizing existing material obtained from the initial excavation of the Work site for re-use as topsoil, Developer must first obtain approval from FCPW as to suitability of its content, including approval of location and method of storage of topsoil for re-use.

3.4 Seeding

3.4.1 Seeding shall be accomplished by Developer using a properly proportioned mixture of inoculated seed approved for use in "Zone One" as detailed in the GDOT's Standard Specifications. Seeding shall only be permitted in the specified planting season for "Zone One" for the specified mixture.

3.4.2 All seeded areas shall be uniformly mulched immediately after seeding.

3.4.3 Developer shall maintain all seeded areas to include mowing, watering and re-seeding any bare areas until a satisfactory stand of grass has been obtained and final acceptance of the Work has been received from FCPW.

3.4.4 Areas showing evidence of settlement or loss of topsoil shall be rebuilt and re-seeded as required.

3.4.5 In general, Developer shall replace existing maintained lawn areas with the same type of grass as was established prior to construction.

3.4.6 Any deviations or alternatives proposed due to unavailability of seasonal grasses or inappropriateness of seeding due to time of year must be presented to the FCPW Inspector in writing with signed authorization of the impacted homeowner(s).

3.5 Preparation of Seeded/Sod Areas

3.5.1 The subgrade for any areas to be seeded shall be brought to a uniform grade by Developer and shall be free of stones larger than one (1) inch, roots, gravel or other debris.

3.5.2 Where topsoil is required by FCPW, the topsoil shall be uniformly graded, trimmed and raked free of unsuitable materials, ridges, bumps or depressions.

3.5.3 Over this area, Developer shall spread agricultural lime at the rate of one hundred (100) pounds per one thousand (1,000) square feet and shall spread a general fertilizer uniformly on the surface of the ground at a rate of thirty-five (35) pounds per one thousand (1,000) square feet.

3.5.4 The lime and fertilizer shall be mixed uniformly into the top four (4) inches of the soil using suitable harrows, tillers or other mechanical equipment.

3.6 Sod Removal/Replacement

3.6.1 On all well established and "sod" type lawns, the Developer may at his discretion, utilizing suitable sod cutting equipment, cut the sod into rolls, carefully remove and store the sod, and water and maintain the same in a viable condition for replacement after backfill.

3.6.2 Any such sod removed and replaced in this manner must be demonstrated to be living to the FCPW Inspector prior to final acceptance of project.

3.6.3 If sod is to be replaced with "new" sod, Developer shall only replace using sod of the same type as that removed.

3.6.4 Any deviations or alternatives proposed due to unavailability of seasonal grasses must be presented to FCPW Inspector in writing with signed authorization of impacted homeowner(s).

PART 4 CONSTRUCTION OVERSIGHT

4.1 General

4.1.1 When calling for an inspection, state whether it is preliminary, final or other specific type of inspection.

4.1.2 No approval of a project will be granted by FCPW until all inspections are conducted, all defects addressed and all appropriate documents have been received and accepted. Letters of preliminary and final inspection/approvals will be sent to Developer by FCPW and placed in Department files.

4.1.3 Any damage to the existing system occurring during construction activities shall be promptly reported to the proper authorities so that proper action may be taken. All associated costs due to damages by Developer shall be borne by Developer.

4.1.4 Cleaning of a newly installed system prior to inspection/approval shall not impair and/or damage an existing system.

4.1.5 Jobsites shall be landscaped to an equal and satisfactory condition as presented prior to start of construction activities.

4.2 Inspection Prior to Installation

4.2.1 Pipe shall be inspected and tested at the mill or warehouse by an independent testing laboratory to determine conformity with the requirements of ASTM standards. Signed and dated certificates stating results of inspection and tests shall be filed with FCPW.

4.2.2 Prior to lowering pipe and appurtenances into the trench, a field inspection may be conducted.

4.2.3 Inspections shall be as described in Section 1 Part 5 and Part 6 for pumping station approval and acceptance.

SECTION 11
FINAL APPROVAL

PART 1 GENERAL

1.1 Final pump station approval and acceptance shall follow the requirements set in Section 1, Paragraph 5.5 of these Design Guidelines.

1.2 Final pump station approval and acceptance submittals shall follow the requirements set in Section, Paragraph 6.4 of these Design Guidelines.

1.3 The Final Plat will be signed by FCPW after the following items have been submitted by Developer and accepted by FCPW:

1.3.1 Completion of installation, inspection(s) and testing(s) per FCPW:

1.3.1.1 Construction Project Log.

1.3.1.2 Signed record drawings.

1.3.1.3 Completed Construction Completion Form.

PART 2 FORCE MAIN CONSTRUCTION COMPLETION FORM

2.1 Developer is to provide FCPW Inspector with Force Main Acceptance Report.

2.2 FCPW will send the “Construction Completion Form” once the as-built drawings are approved.

2.3 Developer must complete and submit the “Construction Completion Form” to FCPW prior to final plat approval.

2.4 A copy of the form is provided in Appendix A.

PART 3 RECORD DRAWINGS

3.1 Record drawings (as-builts) must be submitted to FCPW before a project can receive final approval and/or Certificates of Occupancy.

3.1.1 In order to avoid delays in the "approval process" of developments/subdivisions, as-built drawings should be submitted as soon as the pumping station and/or force main installations are complete to allow sufficient time for review.

3.1.2 As-built drawing set shall be stamped and submitted in PDF format.

3.2 Record drawings must be sharp, clear, clean, legible and submitted on 22”x34” plain paper and the electronic AutoCAD files shall be submitted on USB flash drives.

3.3 The AutoCAD files shall follow the format and requirements presented in Appendix A – Fulton County As-Built CAD Standards of Section 01 78 38 – Record Documents of the "Fulton County Wastewater System Standard Specifications." The files shall also contain x, y, and z coordinates for the appurtenances using the County's approved coordinate plane.

3.4 Record drawings shall include a site plan and any supplemental or shop drawings as may be required by FCPW.

3.5 One (1) complete set of record drawings and one (1) copy of the electronic files shall be submitted by Developer or Developer's Engineer of Record to FCPW for review and approval.

3.6 Two (2) sets of record drawings shall be submitted to FCPW after final approval.

3.7 Record drawings shall be stamped and signed by a Professional Engineer and/or Registered Land Surveyor licensed in the State of Georgia.

3.8 Refer to Section 13, Part 5 for additional requirements.

PART 4 GUARANTEE OF WORK

4.1 The Contractor shall provide a two (2) year comprehensive guarantee of work from the date of final acceptance (from date of final plat approval or Certificate of Occupancy in private developments).

4.1.1 The force mains, appurtenances, pump stations, trenches, roadway and surface restorations, landscaping, and any other areas disturbed by the construction of the project, to be free from defects and to be installed in compliance with the regulations, specifications, plans, directions and construction practices that govern said installations.

4.1.2 Developer shall be responsible for repairs to any leaking pipe, fittings, etc.

4.1.3 Should trenches settle during the guarantee period, Developer shall promptly furnish and place fill to the original grade and restore any damaged landscaping.

4.1.4 Should any leaks or trench settlement occur under new pavement, the Developer shall be held responsible for the cost of the permitting, traffic control, repairs, testing, temporary water to customers, including pavement replacement at the Developer's expense.

4.2 The determination of the requirement for the Developer to perform work under this guarantee shall be at the sole discretion of FCPW.

4.3 If a project requires a series of pump stations, the guarantee of work period for all stations shall extend until the guarantee period for the last pump station expires.

SECTION 12
DESIGN DOCUMENTATION

PART 1 GENERAL

1.1 The following items shall be included with the Design Development Report and Final Design documents.

PART 2 DOCUMENTS REQUIRED

2.1 Geotechnical Reports and subsurface evaluations

2.2 Survey data

- 2.2.1 Topographic
- 2.2.2 Property lines & Easements

2.3 Structural calculations

2.4 Utility Availability and Sizes

- 2.4.1 Electric
- 2.4.2 Water
- 2.4.3 Natural Gas

2.5 Electrical and power capacities

- 2.5.1 Connected loads
- 2.5.2 Utility
  - 2.5.2.1 Ultimate capacity available
- 2.5.3 Generator
  - 2.5.3.1 Total available generator capacity

2.6 Station Hydraulics

- 2.6.1 Station design flows
  - 2.6.1.1 Minimum, Average and Max Day
  - 2.6.1.2 Maximum Month
  - 2.6.1.3 Peaking factors
- 2.6.2 Station System Curves consisting of:
  - 2.6.2.1 Maximum static lift & worst pipe friction
  - 2.6.2.2 Maximum static lift & best pipe friction

2.6.2.3 Lowest static lift & best pipe friction

2.6.2.4 Preliminary pump curves overlaid on the system curves

2.6.3 Pipeline design

2.6.3.1 Gravity

2.6.3.2 Force main

SECTION 13

CONSTRUCTION OBSERVATION, START-UP, TESTING, & RECORD DOCUMENTS

PART 1 GENERAL

1.1 Developer is responsible for installation and maintenance of all erosion control measures until expiration of two-year warranty period. Developer shall remove silt fence and other non-permanent erosion control measures at that time or before if directed by FCPW.

1.2 FCPW will not sign off on the final subdivision plat without the pump station being complete:

1.2.1 All associated fees have been collected.

PART 2 CONSTRUCTION OBSERVATION

2.1 The FCPW Inspector will coordinate with Developer's Contractor to review the construction and installation of the pump station and force main. Reviews and approvals of items of work by the FCPW Inspector are for general conformance with the requirements of these standards and the approved plans. In no way does the review and approval of an item of work relieve Developer of his responsibility to comply with all building codes, safety standards and environmental regulations.

2.2 Items of Work to be reviewed by Engineer of Record during the construction of the pump station and force main include:

2.2.1 Subgrade compaction testing.

2.2.2 Backfill compaction testing.

2.2.3 Pipe restraints.

2.2.4 Duct bank installation.

2.2.5 Driveway and pad subgrade.

2.2.6 Concrete reinforcement placement.

2.2.7 Concrete strength testing.

2.2.8 Structure leakage.

2.2.9 Electrical and I&C checkout and testing.

2.2.10 Pump checkout and testing.

2.3 Developer must notify FCPW Inspectors a minimum of 5 business days, which is minimum for all inspections, in advance of the activities to be inspected.

2.4 FCPW Inspectors are responsible for approval of items reviewed. Results of compaction testing, if required, must meet minimum specifications.

2.5 FCPW's failure to inspect does not relieve Developer of performing and documenting necessary inspection and testing.

PART 3 START-UP

3.1 The required force main tests must be complete and accepted by FCPW Inspectors prior to scheduling a start-up (See Testing below).

3.2 To schedule a start-up, call the FCPW Inspector a minimum of 5 business days in advance. See Appendix A for Pump Station Start-Up Checklist and specifications for detail requirements. Pre-start-up check sheet must be signed, completed and received by the FCPW Inspector 5 business days before start-up. The check sheet may be faxed to the FCPW Inspector.

3.3 All utilities must be working (i.e., water, electric, telephone and gas, if applicable). All utility information shall be brought to the start-up. Required information includes account numbers, phone numbers and any letters or tests performed which require written documentation (e.g., letter of compaction, 4-hour load bank test on generator, etc.).

3.4 The following personnel shall be on site during start-up:

- 3.4.1 General contractor or Developer
- 3.4.2 Electrical contractor
- 3.4.3 Pump manufacturer
- 3.4.4 Generator manufacturer
- 3.4.5 FCPW Inspector
- 3.4.6 FCPW pump station personnel
- 3.4.7 Design Engineer
- 3.4.8 Electrical Engineer.

3.5 A demonstration that the submersible pumps can be removed and installed in the wet well without special equipment or manipulation must be performed at the time of start-up.

3.6 A demonstration that the generator is capable of providing the required power with all installed equipment operating simultaneously must be performed at the time of start-up.

3.7 A letter from the pump manufacturer stating the pumps are ready to be started and operated is required prior to operating the pumps.

3.8 All spare parts and O&M manuals including, but not limited to, O&M manuals for pumps and generator shall be provided to the County prior to start-up.

3.9 Keys for the generator shall be left in the transfer switch.

3.10 Flowmeter shall be used for pump testing.

PART 4 TESTING

4.1 Force Main

4.1.1 Prior to acceptance of the force main, Developer shall test the force main in accordance with the requirements of these Guidelines.

4.1.2 Force mains shall be subjected to a minimum test pressure equal to 150 percent of the total dynamic head or 100 psi (whichever is greater)for a minimum of two hours. The test shall be performed using potable water. (Use of a fire Hydrant requires a fire hydrant meter to be rented from local water utility). The entire force main pressure test must be witnessed and approved by the FCPW Inspector. The test shall be performed from the check valve vault to the discharge manhole. No leakage will be allowed

4.1.3 To schedule a test, Developer shall notify the FCPW Inspector at a minimum of 5 business days in advance. The inspector shall determine the test pressure and gauge location. Developer shall remove, valve off, or otherwise protect any equipment that might be damaged by the pressures used in the test. All piping shall be securely anchored prior to the test. Pipe laid in trenches shall be backfilled. Joints, fittings and valves may be left exposed to be examined during the test.

4.1.4 Before applying the test pressure, all air shall be expelled from the pipe through installed air release valves. Combination air release valves shall be available at high points.

4.1.5 The approval of the force main installation and pressure test by the FCPW Inspector shall become a part of the overall pump station/force main system approval.

4.1.6 Developer shall bear the complete cost of the test including temporary plugging and blocking, water usage and the repair of all leaks.

4.1.7 If a section of the force main fails the pressure test Developer will be required to pay a re-inspection fee as determined by the FCPW Inspector prior to each additional retest required.

4.1.8 A copy of the Pressure Test Form is provided in Appendix A.

4.2 Pump Station

4.2.1 Prior to acceptance of the pump station, Developer shall conduct performance tests on all pumps and equipment provided in accordance with the requirements of these Guidelines to demonstrate compliance with the specified performance requirements.

4.2.2 Pumps shall be individually operated at all specified operating conditions.

4.2.2.1 Developer and pump manufacturer shall coordinate to provide the means to recirculate pumped fluid.

4.2.2.2 Alternatively, throttle the pumps to achieve the specified head at specified flow.

4.2.3 No testing of the pumps will be permitted until the force main has been tested and accepted by the FCPW Inspector.

4.2.4 The following personnel shall be present on site during pertinent testing:

4.2.4.1 General contractor or Developer

4.2.4.2 Electrical contractor

4.2.4.3 Pump manufacturer

4.2.4.4 Generator manufacturer

4.2.4.5 FCPW Inspector

4.2.4.6 FCPW pump station personnel

4.2.4.7 Design Engineer

4.2.4.8 Electrical Engineer

4.2.4.9 System integrator

4.2.4.10 Odor control manufacturer

4.2.5 Tests to Conduct include:

4.2.5.1 Pump performance (flow and head) tests.

4.2.5.2 Automatic switchover to backup power.

4.2.5.3 Generator load bank test.

4.2.5.4 Remote Telemetry Unit Operation.

4.2.5.5 Remote Telemetry Unit Communication Test.

4.2.5.6 Pump control system.

4.2.6 Pump station will be accepted when proven to meet the design flow and head requirements and all components operate properly for a minimum of 4 weeks, as determined by FCPW pump station personnel.

4.2.7 Equipment supplier to provide within their price all labor and effort to support Pre-operational check out, Functional Testing and Start-Up Testing. Developer shall provide temporary flow meters and pressure gauges as necessary

4.3 Remote Telemetry Unit

4.3.1 All elements of the RTU hardware shall be tested to demonstrate that the total system satisfies all of the requirements of these Guidelines. System

Integrator (SI) shall coordinate all tests with FCPW. SI shall notify FCPW two weeks in advance of any tests.

4.3.2 As a minimum, the testing shall include the following:

4.3.2.1 Functional onsite acceptance test.

4.3.3 Each test shall be in the cause and effect format. The person conducting the test shall initiate an input (cause) and upon the systems or subsections producing the correct result (effect), the specific test requirement will have been satisfied. Each of the inputs or conditions shall be tested:

4.3.3.1 Digital Inputs.

4.3.3.2 Digital Outputs.

4.3.3.3 Analog Inputs (minimum scale, midscale and maximum scale).

4.3.3.4 Power Faults.

4.3.3.5 Communication Faults.

4.3.4 All tests shall be conducted in accordance with, and documented on, prior Engineer-approved procedures, forms and checklists. Each specific test to be performed shall be described and a space provided after it for sign off by the appropriate party after its satisfactory completion.

4.3.5 Copies of these sign off test procedures, forms and checklists will constitute the required test documentation.

4.3.6 Provide all special testing materials and equipment.

4.3.7 Functional Onsite Acceptance Test :

4.3.7.1 Tests shall be witnessed by FCPW and System Integrator.

4.3.7.2 Tests shall demonstrate specified functions, both hardware and software, to the satisfaction of FCPW.

PART 5 RECORD DOCUMENTS

5.1 Developer shall maintain on the project site an updated set of record drawings. These drawings must be the latest revision and match that of the FCPW Project Inspector.

5.2 Developer's Design Engineer shall submit as-built drawings upon completion of construction and acceptance of the pump station and force main by FCPW. Surveying shall be performed by the Design Engineer to assure elevations and placement of appurtenances on as-builts are correct.

5.3 **Two (2) sets** of pump station and force main as-built plans shall be submitted to FCPW prior to scheduling a start-up. As-built plans must be approved by FCPW prior to conducting a start-up. An exception to this procedure may only be made if approval is given by FCPW. Allow two weeks for review.

5.4 Pump station and force main as-built plans shall include an original signed and dated stamp of a Professional Engineer (registered in the State of Georgia). Updated design calculations must also be submitted with as-builts.

5.5 Pump station and force main as-built drawings shall reflect the structures as they are actually installed. The as-builts should be completed from the approved construction drawings with redlines of construction changes, as well as notations of all variances from the approved plans.

5.6 As-built drawings shall include GPS coordinates for valves, fittings and other above grade appurtenances and elevation of top of force main at least every 100 feet or as directed by the FCPW Inspector.

5.7 A single line electrical drawing showing power distribution for the station shall be included in the as-built drawings.

5.8 If any changes were made to the force main route, wet well depth or pumps after the submitted plans were approved, new design calculations must be submitted with the as-built plans.

5.9 Submittals.

5.10 Construction Reports.

5.11 Equipment field tests.

5.11.1 Pumps, generator, I&C, electrical, etc.

5.12 Final pump system and pump curves based on as-installed configuration.

PART 6 OPERATION AND MAINTENANCE MANUAL

6.1 Developer shall prepare and submit a minimum of two (2) hard copies and one (1) searchable electronic copies of the Pump Station and Force Main Operation and Maintenance (O&M) Manual to FCPW.

6.2 Electronic O&M manuals copies shall be in PDF format and drawings are to be in AutoCAD (current Version as utilized by FCPW). O&M Manuals shall contain the following constituents:

6.2.1 Technical Data

6.2.2 Performance curves and Operation Elevations

6.2.3 Pump Outline Drawings

6.2.4 Control Drawings and Data

6.2.5 Submittal Drawings

6.2.6 Access Frame Drawings

6.2.7 Redline As-Built Drawings

6.2.8 Equipment Installation Guides

6.2.9 Technical Manuals

6.2.10 Specifications

6.2.11 Parts Lists

6.2.12 Equipment Usage Instruction Manuals

6.2.13 Applicable Printed Warranty

6.2.14 Manufacturer's Equipment Storage Instructions

6.2.15 Recommended Start-up Procedure Data Form

6.3 The O&M manuals are also to contain, the following information:

6.3.1 Approved shop drawings, including design data for all installed equipment and each major component, and a pump curve/system curve analysis showing the design operating points.

6.3.2 P&ID and Control panel wiring diagrams.

6.3.3 Warranty information for all installed equipment and each major component.

6.3.4 Inventory, functional descriptions and complete operating instructions and troubleshooting for all installed equipment and each major component.

6.3.5 Instructions for start-up/shut-down as well as for calibration and adjustment of all installed equipment and each major component.

6.3.6 Recommended maintenance management system, including preventative and predictive maintenance, for all installed equipment and each major component.

6.3.7 Contingency plan and analysis of critical safety issues.

6.3.8 Contact information for local service companies as well as instructions for replacement of all installed equipment and each major component.

6.3.9 Contact information for local contractors capable of performing emergency repairs.

6.3.10 Contact information for regulatory and other agencies.

APPENDIX A

FORMS AND CHECKLISTS

FORMS AND CHECKLIST SANITARY SEWER PUMP STATION AND FORCE MAIN	
DETAIL NUMBER	**TITLE**
A-1	PUMP STATION AND FORCE MAIN DESIGN REVIEW CHECKLIST
A-2	PUMP STATION DESIGN CONCEPT REVIEW FORM
A-3	PUMP STATION DESIGN REVIEW FORM
A-4	PUMP STATION DESIGN CALCULATION FORM
A-5	FORCE MAIN DESIGN PLAN CHECKLIST
A-6	ENGINEER’S CERTIFICATE CONSTRUCTION COMPLETION FORM
A-7	PUMP STATION AND FORCE MAIN STARTUP-READINESS CERTIFICATION
A-8	WASTEWATER AS-BUILT CHECKLIST
A-9	RELEASE FOR FORCE MAIN CONSTRUCTION FORM
A-10	REQUEST FOR EXCEPTION/CHANGE TO PUMP STATION CONSTRUCTION FORM
A-11	GEORGIA DEPARTMENT OF TRANSPORTATION CHECKLIST
A-12	MINIMUM INFORMATION REQUIRED FOR GUPS UTILILTY PERMIT APPLICATION
A-13	PRESSURE TEST FORM

FULTON COUNTY PUBLIC WORKS
PUMP STATION AND FORCE MAIN DESIGN REVIEW CHECKLIST

PROJECT NAME:		DATE
PROJECT NUMBER:		
PROJECT ADDRESS:		REVIEW No.:
LAND LOT:	DISTRICT/SECTION:	
ENGINEER NAME:		
ENGINEER PHONE & EMAIL:		REVIEWED BY:
CONTRACTOR/DEVELOPER NAME:		
CONTRACTOR/DEVELOPER PHONE:		
CONTRACTOR/DEVELOPER EMAIL:		

The engineer is referred to the Fulton County Public Works "Sanitary Sewer Pump Station and Force Main Design Guidelines".

This checklist is intended to be a guide in preparing the pump station and or force main plans. This checklist is not all compassing. It is left to the Engineer's discretion to decide what additional information may be needed to complete the plans. Approval of plans does not relieve the contractor of meeting the FCDPW "Sanitary Sewer Pump Station and Force Main Design Guidelines".

CHECKLIST PROCEDURES

1. ADDRESS THE CORPORATE COMMENTS MARKED IN RED.
2. RESPOND ON CHECKLIST IN GREEN TO INDICATE COMMENT WAS ADDRESSED.
3. MENTION DRAWING NUMBER WHERE COMMENT WAS INCORPORATED.
4. PLACE ALL LIST STATION DRAWINGS IN ONE LOCATION.
5. RETURN CHECKLIST, RED LINE PLANS AND REVISED PLANS THE REVIEWER.

NOTE: All design drawings and associated calculations, are to be sealed, signed and dated by a Georgia–Licensed Professional Engineer.

ALL SHEETS

- ◻ Final plans shall be on 24" X 36" paper sheets.
- ◻ Each sheet except the cover sheet shall have a title block in the lower right corner containing:
  - ◻ Project name
  - ◻ Project number (if a Fulton County project)
  - ◻ Sheet number
  - ◻ Total number of sheets
  - ◻ Scale
  - ◻ Drawer's, Designer's and Checker's initials, and date
  - ◻ Date (month/day/year)
- ◻ All sheets shall be sealed, signed and dated by a Civil Engineer licensed in the State of Georgia.

FULTON COUNTY

FULTON COUNTY PUBLIC WORKS PUMP STATION AND FORCE MAIN DESIGN REVIEW CHECKLIST	
PROJECT NAME:	DATE
PROJECT NUMBER:	
PROJECT ADDRESS:	REVIEW No.:
LAND LOT: DISTRICT/SECTION:	
ENGINEER NAME:	
ENGINEER PHONE & EMAIL:	REVIEWED BY:
CONTRACTOR/DEVELOPER NAME:	
CONTRACTOR/DEVELOPER PHONE:	
CONTRACTOR/DEVELOPER EMAIL:	

COVER SHEET

The Engineer shall provide a cover sheet with the following information:

- ◻ Project name
- ◻ Drawing Index which provides sheet number and a description of the corresponding sheet
- ◻ Table of Quantities such as Pipe, MH's, etc.
- ◻ Vicinity Map
- ◻ District and Land Lot number
- ◻ Engineering firm's name, address and telephone number
- ◻ Developer's name, address and telephone number
- ◻ Date (month/day/year)
- ◻ Signature Approval Blocks

SHEET 2

The Engineer shall provide a general sheet containing the following information:

- ◻ General notes covering important parameters as outlined in the FCPW "*Sanitary Sewer Pump Station and Force Main Design Guidelines"*.
- ◻ Other notes as necessary to cover situations not covered by the Design Standards or by the FCDPW Standard Details.
- ◻ Legend showing symbols and line types used within the drawings.
- ◻ Engineering's firm title block containing firm's name, address, and phone number.
- ◻ Elevation datum and benchmark information in State Plane Coordinates.
- ◻ Note to be shown on plan: Contractor shall notify Fulton County Public Works Inspector 5 business days prior to start of Construction.

PUMP STATIONS GENERAL

- ◻ Pump Station Service Area Map clearly showing basin delineation of the area draining to the pump station by gravity.
- ◻ Show all offsite areas that have the potential to discharge to the proposed pump station. Provide calculations used to determine offsite flows.
- ◻ Pump Station Driveway Plan & Profile.
- ◻ Non-standard, but structures approved to be built.
- ◻ Pump Station Gravity Sewer Influent Profile.

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PUMP STATIONS GENERAL (Continued)

- ☐ Pump Station to be located at the lowest point of the basin. Show ground contours and 100 year and 500 year flood contour as well as 25 foot and 75 foot stream buffers (if applicable).
- ☐ Average Daily Flow (ADF) to be calculated based on Sanitary Flow Contribution numbers specified in the table provided in FCDPW "*Sanitary Sewer Pump Station and Force Main Design Guidelines*".
- ☐ Capacity Calculations for the receiving downstream sewer, to justify it is not capacity limited.
- ☐ Install Safety Placards for all pump station structures and equipment as per OSHA standards. Show details on standard detail drawings for contractor to follow.
- ☐ Install station identification signs, including name and emergency contact information. Show details on standard detail drawings for contractor to follow.
- ☐ Refer to "*Sanitary Sewer Pump Station and Force Main Design Guidelines*".

PUMPS AND WET WELL

- ☐ Pumps to be manufactured by an approved vendor.
- ☐ System Head Curve for different "C" values for new and aged pipe conditions.
- ☐ Pump details, specifications and shop drawings as per standards. Explosion proof Submersible variable Speed Pumps shall be used.
- ☐ Pump size and dimensions, as part of pump schedule.
- ☐ Pump clearances between pump-to-pump and pump-to-sidewall, and pump-to-hatch as per manufacturer's recommendation. Show all dimensions on wet well cross section.
- ☐ Wells shall be cylindrical with a minimum 8 foot diameter.
- ☐ Rectangular wet wells may be allowed upon approval.
- ☐ Minimum depth of wet well to be 8 feet.
- ☐ Indicate high and low ground water elevations. Provide anti-flotation calculations.
- ☐ Indicate Pump Control Elevations in the Wet Well for the following conditions: High Level Alarm, Lag Pump On, Lead Pump On, Pumps Off, and Low Level Alarm.
- ☐ Mark Storage Volume above the high-level alarm and up to the lowest point of overflow. This volume shall be greater than or equal to volume generated over three hours at peak design flow. Backflow of sewage into manholes upstream of the wet well is not permitted. In lieu of storing the total three hour peak flow volume within the wet well.

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PUMPS AND WET WELL (Continued)

- ☐ Provide calculations to justify adequacy of storage volume provided in the Wet Well. Overflow Vault calculations shall be provided if the County has approved an Overflow Vault for use. Entry hatch shall be large enough to remove pumps for servicing.
- ☐ No ladders shall be permitted in wet well.
- ☐ Provide hoist for equipment outside the wet well.
- ☐ Sump to be designed as per manufacturer's recommendation for a specific pump; however, wet well floor shall have a minimum slope of 1:1 to the hopper bottom.
- ☐ Only one sewer line to enter the wet well.
- ☐ Electric connections in the wet well shall be explosion proof.

VALVE & METER COMBINED VAULT

- ☐ Valve details, specifications, and shop drawings.
- ☐ Minimum 12 foot by 6 foot in size.
- ☐ Combined Vault shall be below grade, but adjacent to the wet well, have a 2% sloped concrete floor with sump, concrete side walls and aluminum hatches.
- ☐ Check Valves to be placed upstream of Shut-off Valves.
- ☐ Pressure Gauge Taps with diaphragm mounted seals shall be located on each pipe upstream of the check valve.
- ☐ Flow meter details, specifications, and shop drawings.
- ☐ Flow meter to be installed downstream of valves, minimum straight pipe length upstream and downstream of the meter shall be based on manufacturer's recommendations and meter sizes.

GENERATOR

- ☐ Standby Generator details, specifications, and shop drawings.
- ☐ The standby generator shall have adequate capacity to run a pumps, equipment, lifting hoist, lighting, telemetry, etc. simultaneously. The engineer shall provide submittals to justify adequate capacity for review and approval by FCDPW.
- ☐ Automatic Transfer Switch specifications and shop drawings.
- ☐ Automatic Transfer Switch to be rated for 100% of full load, and placed in a NEMA 4X enclosure. Power outage, phase loss, or low voltage, shall be experience for 30 seconds before the station is switched to generator power.
- ☐

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GENERATOR (Continued)

- ☐ Generators shall meet all new EPA air emission standards, and be equipped with auxiliary systems, such as batteries, battery charger, block heater, etc.
- ☐ Generators are to be installed to operate on natural gas if available.
- ☐ Leak detection device in the interstitial space for sensing fuel leakage. This device to be connected to generator telemetry.
- ☐ Provide Generator Calculations.

TELEMETRY

- ☐ Telemetry equipment details, specifications, and shop drawings.
- ☐ Telemetry system to be capable of sending signals to personnel 24 hours per day, 365 days per year.
- ☐ Standard system is Mission SCADA MyDro 850.

ELECTRICAL

- ☐ All Electrical Systems to comply with NFPA 70, "National Electric Code", NFPA 820 "Standard for Fire Protection in Wastewater Treatment & Collection Facilities", ANSI, as well as applicable federal, state and local codes.
- ☐ Include Electrical Legend on plans.
- ☐ Include labels on all electrical enclosures
- ☐ Include Wiring Schedule on plans.
- ☐ Include the following warning sign in bold on plans:

  "Lock out all power while working on any equipment to avoid electrical shock or equipment activation."
- ☐ Main Power Feed to be above-grade, disconnect switch.
- ☐ Incoming Electrical Service to be equipped with Surge Protection installed in a NEMA 4X enclosure.
- ☐ Surge Suppressor shall be U.L. listed and labeled under UL 1449 and UL 1283. See "*Sanitary Sewer Pump Station and Force Main Design Guidelines*"
- ☐ Single Line Electrical Drawing showing power distribution for the proposed pump station, including pump control panel detail.
- ☐ Pump Station Power Riser Diagram.
- ☐ Electrical Conduits shall be at a minimum as stated within "*Sanitary Sewer Pump Station and Force Main Design Guidelines*"

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CONTRACTOR/DEVELOPER EMAIL:	

ELECTRICAL (Continued)

- ☐ VFDs required for pumps greater than or equal to 20 horsepower rating and reduced voltage starters for less than 20 hp.
- ☐ Electrical enclosures, Switching Gears, and Conduits shall be outside the Wet Well area, and protected from vehicular traffic and flooding.
- ☐ Provide for electrical control panels 4'W x 8'H x 24'L awning and trim, 8" to 10" base plates on vertical supports. Four vertical supports front side, four vertical supports back side.

INSTRUMENTATION AND CONTROLS

- ☐ Wastewater levels within wet wells to be detected through the use of submersible pressure level transducer as primary and ultrasonic transducer as backup. No float switches will be allowed for pump control.
- ☐ Pump Station Control & Instrumentation Riser Diagram
- ☐ Phase monitor to be connected to the PLC for monitoring and remote indication of open phase/phase reversal condition.
- ☐ Allen Bradley Programmable Controller to control and monitor all pump station functions.
- ☐ Human Machine Interface (HMI) requirements to be fulfilled by pre-approved system integrator.
- ☐ Connect HMI to PLC.
- ☐ Provide separate NEMA 4X Stainless Steel enclosure for controls. Controls and electrical may not share the same cabinet.
- ☐ Refer to "*Sanitary Sewer Pump Station and Force Main Design Guidelines*" for Pump Station I/O List. *Sanitary Sewer Pump Station and Force Main Design Guidelines*
- ☐ Electrical Grounding & Bonding Riser Diagram for all components as per National Electrical Code, local codes and ordinances.

LIGHTS

- ☐ Lighting plans to include location, type and power distribution.
- ☐ Outside Lighting Control Schematic.
- ☐ Install at least two 120 Volt LED Security Lights on Break Down Poles (quantity to be determined based on site layout.) Pole to be aluminum and light to turn on automatically with motion at night

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CONTRACTOR/DEVELOPER EMAIL:	

FORCE MAINS

Plan view shall show to proper scale. Scale shall not be more than:

- ◻ Plan: 1 inch 50 feet

Profile: Horizontal: 1 inch = 50 feet

Vertical: 1 inch = 10 feet

- ◻ Plan view shall show the following:
  - ◻ All streets, alleys and easements. They shall be dimensioned at least once and at breaks. Streets shall be identified by name.
  - ◻ All abutting lots shall be identified by lot number, tract and subdivision.
  - ◻ All topography within and to at least five (5) feet beyond easements and topography affected by construction shall be shown.
  - ◻ Location of all above underground utilities, including storm and sanitary sewers, water lilies, dry wells, buried telephone lines natural gas, power, and cables. Existing utilities shall be shown as dashed lines or faded lines with type, size, and other available information called out.
  - ◻ All structures, paving and other topographic features within the vicinity, such as trees, shall be shown and identified by name, size and type.
  - ◻ Location of proposed force main lines and appurtenances. Items shall be identified by name and number, size, and type, and stations.
  - ◻ Location of all existing and proposed easements.
  - ◻ Location of all existing benchmarks shall be shown and identified by type.
  - ◻ Location of all connections to existing sewer lines.
  - ◻ Show horizontal clearance from buildings, structures, drainage culvert, and water mains.
  - ◻ Show tie in points to FCDPW existing system.
  - ◻ Location of soil boring holes.
  - ◻ All sheets shall have a north arrow orienting the plan view.
- ◻ Profile view shall show the following:
  - ◻ Existing utilities which cross the proposed utility. Identify crossing utility by name, pipe size, pipe material, type of utility (use) location (station), and elevation. Location and elevation are to be obtained from "as-built" plans paying particular attention to any differences in datum.

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FORCE MAINS (Continued)

NOTE: Any and all existing underground utilities shown on profile are assumed to be shown in approximate location only.

- ☐ All force mains require a profile.
- ☐ Show existing ground and proposed ground.
- ☐ Show manhole number, station, rim, and invert elevations.
- ☐ All appurtenances such as valves, vaults, fittings and restraints. Identify by name, size, type, station and elevation.

☐ All sheets shall show match lines labeled as such with station and sheet number.

☐ Proposed force mains shall be shown as solid lines with sizes, slope, material, and pipe classes called out. For example: 8 inch HDPE – DR11.

☐ Show any lift stations adjoining the gravity sanitary sewer system.

☐ Force main, including the pump discharge through the meter and valve vault, shall be constructed using High Density Polyethylene (HDPE) pipe and fittings.

☐ Provide Tracker Tape or wire on HDPE pipes to facilitate accurate locating in the future.

☐ Provide valve with Quick Connect for a bypass pump (to be used in case of complete pump station failure).

☐ Include calculations to demonstrate that velocity of flow in the force main is a minimum of 3 feet per second and maximum of 7 feet per second.

☐ Force mains cannot be installed in lieu of gravity sewers to convey flow downhill to an existing receiving sewer.

☐ Provide isolation valve on the force main just beyond and flow meter vault.

☐ Cross section of the receiving structure as well as pertinent details such as inverts of all pipes, pipe sizes, pipe material, benching, ground elevation, top elevation, notes, etc.

DETAIL SHEETS

☐ Include FCPW "*Sanitary Sewer Pump Station and Force Main Design Guidelines*" to be used on the project.

☐ Include any other details specific to the project that are not covered by FCPW "*Sanitary Sewer Pump Station and Force Main Design Guidelines*"

☐ Detail sheets shall be located at the end of the plan set and referenced where used.

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PUMP STATION AND FORCE MAIN DESIGN REVIEW CHECKLIST

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CONTRACTOR/DEVELOPER EMAIL:		

ODOR CONTROL

- ☐ Odor Control equipment details, specifications, and shop drawings.
- ☐ Wet well 4 inch vent to an Odor Control system.
- ☐ Odor Control is required for pump stations constructed within 40 feet of the residence.

SITE DESIGN

- ☐ Pump Station shall be install within a 340 feet square parcel dedicated to Fulton County.
- ☐ Provide a 20 foot easement for force mains.
- ☐ Subgrade for pad, turnaround and access road, side slopes and any other features within the fence line must be compacted to a minimum of 95% Standard Proctor Compaction.
- ☐ Access Road and Turnaround to be constructed of concrete on a six-inch layer of 95% compacted aggregate base course.
- ☐ Odor Control equipment details, specifications, and shop drawings.
- ☐ Wet well 4 inch vent to an Odor Control system.
- ☐ Odor Control is required for pump stations constructed within 40 feet of the residence.

SITE DESIGN

- ☐ Pump Station shall be install within a 340 feet square parcel dedicated to Fulton County.
- ☐ Provide a 20 foot easement for force mains.
- ☐ Subgrade for pad, turnaround and access road, side slopes and any other features within the fence line must be compacted to a minimum of 95% Standard Proctor Compaction.
- ☐ Access Road and Turnaround to be constructed of concrete on a six-inch layer of 95% compacted aggregate base course.
- ☐ Provide fences 8 foot high with number 4 chain link wire fabric with top rails, bottom tension wires and 3 strands of barbed wire at the top on angled extension arms.
- ☐ Provide 20 foot wide (minimum) rolling gate on 6-inch diameter posts plus a 4 foot wide walk through gate.
- ☐ Side slopes steeper than 3H:1V to be protected with juniper or FCPW approved equivalent.
- ☐ Minimum access road width to be 20 feet.
- ☐ Minimum turnaround radius to be 45 feet.
- ☐ Pump Station to be at least 2 feet above 25 feet horizontally away from the 100 year flood line as determined by the most recent FEMA Flood Insurance Rate Map, or as established by acceptable modeling techniques.

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CONTRACTOR NOTES (TO BE SHOWN ON PLANS)

- ☐ Contractor to ensure that Power Company notifies Technical Services of FCPW about the availability of 3-Phase Power and Voltage to the site. See Section 7 of the "Sanitary Sewer Pump Station and Force Main Design Guidelines".
- ☐ Demonstrate pumps will not cavitate freewheeling (operate at pump run-out), or deadheading (operate at pump shut-off). This type of operation shall not be allowed.
- ☐ Demonstrate minimum time between pump starts is 10 minutes.
- ☐ Provide 3 sets of Operation & Maintenance Manuals, 2 hard copies and 1 searchable electronic copy, to FCPW for the Generator and Automatic Transfer Switch.
- ☐ Demonstrate Generator is load tested at 100% full load on site for a period of four (4) hours.
- ☐ Demonstrate generators are capable of shutting down and activating the audible/visual alarms and telemetry if a damaging operating condition develops.
- ☐ Provide Stand-by Generator (Cummins or Caterpillar) specifications and shop drawings.
- ☐ Provide Automatic Transfer Switch specifications and shop drawings.
- ☐ Provide a 24-month (from date of commissioning) comprehensive warranty.
- ☐ Provide Telemetry equipment details, specifications, and shop drawings.
- ☐ Demonstrate Low-Level Alarm, Pumps-off, Lead Pump-on Lead Pump-off and High Level Alarm settings are functional.
- ☐ The Contractor shall install and provide all equipment as well as conduct tests in accordance with "Fulton County Sanitary Sewer Pump Station and Force Main Design Guidelines"
- ☐ No underground fuel storage tanks shall be permitted.
- ☐ Contractor to install Safety Placards and warning Signs on all equipment as per OSHA standards.
- ☐ Contractor/Developer is responsible for complete writing and programming of the PLC and RTU.
- ☐ Contractor to obtain 480 Volts, 3 Phase Power at the pump station.

FULTON COUNTY

FULTON COUNTY PUBLIC WORKS PUMP STATION DESIGN CONCEPT REVIEW FORM		
PROJECT NAME:		DATE
PROJECT NUMBER:		
PROJECT ADDRESS:		REVIEW No.:
DEVELOPMENT NAME:		
LAND LOT:	DISTRICT/SECTION:	
ENGINEER NAME:		
ENGINEER PHONE & EMAIL:		REVIEWED BY:
CONTRACTOR/DEVELOPER NAME:		
CONT./DEV. PHONE & EMAIL:		

PUMP STATION SITE DATA

MUNICIPALITY			
ZONING	OF PROPOSED DEVELOPMENT		
	OF REMAINDER OF SUB-BASIN		
LAND USE	EXISTING		
	PROPOSED		
AUTHORITIES HAVING JURISDICTION	LAND DISTURBANCE PERMIT		
	WATER SUPPLY		
	D. O. T. (access road)		
AREA OF SITE (acres)			
AREA OF DRAINAGE BASIN (acres)			
IS THE SITE ALREADY DEVELOPED?			
IS THE OFFSITE AREA IN THE DRAINAGE BASIN ALREADY DEVELOPED?			
DISTANCE TO THE NEAREST GRAVITY SEWER (feet)			
DIFFERENCE IN ELEVATION BETWEEN THE LOWEST F.F.E. AND NEAREST GRAVITY SEWER (feet)			
LOCATION OF PROPOSED CONNECTION TO EXISTING SANITARY SEWER			

IS THE PROPOSED PUMP STATION SITE WITHIN THE FOLLOWING?	100-YEAR FLOODPLAIN		ELEVATION, ft
	500-YEAR FLOODPLAIN		ELEVATION, ft
	FEMA FLOODWAY		
	WETLANDS		

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CONT./DEV. PHONE & EMAIL:		

JUSTIFICATION THAT THE PROPOSED DEVELOPMENT REQUIRES A PUMP STATION

FLOW DATA

FLOW SOURCES - (Use additional sheets to show type, quantity, and flow per source)

ESTIMATED WASTEWATER FLOW TO PUMP STATION	ANNUAL AVERAGE DAILY FLOW		gallons / day
	PEAK DAILY FLOW		gallons / day
	PEAKING FACTOR USED		

REQUIRED ATTACHMENTS

☐ Proposed site located on a USGS Quadrangle map, with the proposed pump station location shown.

☐ The map shall show the limits of the proposed development and of the sub-basin that drains to the pump station.

☐ Location of proposed connection to receiving sanitary sewer.

☐ Projection of wastewater flows generated by the proposed development.

☐ Projection of wastewater flows generated in the remainder of the sub-basin.

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DESIGN DATA

PUMP DATA

Manufacturer's pump information including referenced curves to be provided.

QUANTITY OF PUMPS:

MANUFACTURER:

MODEL NUMBER:

IMPELLER DIAMETER: CURVE NUMBER:

MOTOR HORSEPOWER: SPEED (rpm):

SUCTION SIZE (inches): DISCHARGE STZE (inches):

DRY-PIT SUBMERSIBLE: ☐ YES ☐ NO

OTHER FEATURES

PUMP CAPACITY DATA

Operating points to be identified on pump curves. System curves to be overlaid on pump curves.

A. INITIAL

1. RATED OPERATING CONDITION - PUMP MANUFACTURER GUARANTEED CONDITION

FLOW ____ gpm at HEAD ____ Ft

NPSH 3% ____ gpm at SPEED ____ rpm, at rated condition

LOCATION ON CURVE (AOR / POR) ____ EFFICIENCY (%) ____

2. CONDITION OF MAXIMUM PUMP SPEED AGAINST MINIMUM SYSTEM HEAD

FLOW ____ gpm at HEAD ____ Ft

NPSH 3% ____ gpm at SPEED ____ rpm, at rated condition

PPP LOCATED IN POR? ☐ YES ☐ NO EFFICIENCY (%) ____

LOCATED TO RIGHT OF BEQ? ☐ YES ☐ NO POWER (HP) ____

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3. CONDITON OF CONTINUOUS DUTY MINIMUM SPEED

FLOW ____ gpm at HEAD ____ Ft

NPSH 3% ____ gpm at SPEED ____ rpm, at rated condition

LOCATED IN POR ☐ YES ☐ NO EFFICIENCY (%) ____

4. CONDITION FOR MOMENTARY STARTUP / SHUTDOWN

HEAD ____ Ft

ANTICIPATED NUMBER OF CYCLES PER DAY ____

5. MAXIMUM EXPECTED SURGE PRUEESUR

____ Ft

B. REQUIRED FUTURE CONDITIONS (IF DIFFERENT THAN INITIAL)

1. RATED OPERATING CONDITION - PUMP MANUFACTURER GUARANTEED CONDITION

FLOW ____ gpm at HEAD ____ Ft

NPSH 3% ____ gpm at SPEED ____ rpm, at rated condition

LOCATION ON CURVE (AOR / POR) ____ EFFICIENCY (%) ____

2. CONDITION OF MAXIMUM PUMP SPEED AGAINST MINIMUM SYSTEM HEAD

FLOW ____ gpm at HEAD ____ Ft

NPSH 3% ____ gpm at SPEED ____ rpm, at rated condition

PPP LOCATED IN POR? ☐ YES ☐ NO EFFICIENCY (%) ____

LOCATED TO RIGHT OF BEQ? ☐ YES ☐ NO POWER (HP) ____

3. CONDITON OF CONTINUOUS DUTY MINIMUM SPEED

FLOW ____ gpm at HEAD ____ Ft

NPSH 3% ____ gpm at SPEED ____ rpm, at rated condition

LOCATED IN POR ☐ YES ☐ NO EFFICIENCY (%) ____

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CONT./DEV. PHONE & EMAIL:	

4. CONDITION FOR MOMENTARY STARTUP / SHUTDOWN

HEAD ______ Ft

ANTICIPATED NUMBER OF CYCLES PER DAY ______

5. MAXIMUM EXPECTED SURGE PRUEESUR

______ Ft

ELECTRICAL

A. UTILITY

PROVIDER ______

VOLTAGE ______ PHASE ______

POWER FACTOR ______

B. STATION FULL LOAD AMPS ______

C. GENERATOR ______

MANUFACTURER ______

FUEL TYPE ______

RATING ______ kW ______ kVA

AST MANUFACTURER ______

D. PUMP DRIVES

MANUFACTURER ______

MODEL ______ RATED HP ______

RATED AMPS ______ PULSE RATING ______

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FULTON COUNTY PUBLIC WORKS
PUMP STATION DESIGN REVIEW FORM

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PROJECT ADDRESS:		REVIEW No.:
LAND LOT:	DISTRICT/SECTION:	
ENGINEER NAME:		
ENGINEER PHONE & EMAIL:		REVIEWED BY:
CONTRACTOR/DEVELOPER NAME:		
CONT./DEV. PHONE & EMAIL:		

CONTROL & TELEMETRY

A. PUMP CONTROLLER

1. PLC MMANUFACTURER ______

   PLC MODEL ______ HMI MODEL ______

2. TELEMTRY/SCADA MANUFACTURER ______

   ELEMTRY/SCADA MODEL ______

3. PROPOSED SYSTEM INTEGRATOR ______

REQUIRED ATTACHMENTS

- ☐ All documents required elsewhere.
- ☐ Pump curve and system head curve. Curve data to be provided in table format in addition to graph.
- ☐ Pump details, specifications, and shop drawings, including wet well elevations.
- ☐ Valve details, specifications, and shop drawings.
- ☐ Magnetic flow meter and other instrumentation details, specifications, and shop drawings.
- ☐ Generator details, specifications, and shop drawings, along with automatic transfer switch specifications and shop drawings.
- ☐ Telemetry equipment details, specifications, and shop drawings.
- ☐ Single line electrical drawing showing power distribution for the proposed pump station.
- ☐ Force main design showing size, material, plan, profile, and valve locations.
- ☐ Depiction of receiving gravity sanitary sewer system and connection to proposed pump station force main.
- ☐ Gravity sanitary sewer feeding the new pump station.

FULTON COUNTY

FULTON COUNTY PUBLIC WORKS
PUMP STATION DESIGN CALCULATION FORM

PROJECT NAME:		DATE
PROJECT NUMBER:		
PROJECT ADDRESS:		REVIEW No.:
DEVELOPMENT NAME:		
LAND LOT:	DISTRICT/SECTION:	
ENGINEER NAME:		
ENGINEER PHONE & EMAIL:		REVIEWED BY:
CONTRACTOR/DEVELOPER NAME:		
CONT./DEV. PHONE & EMAIL:		

PUMP STATION SITE DATA

AVERAGE DAILY FLOW OF PROPOSED DEVELOPMENT		gallons / day
AVERAGE DAILY FLOW OF REMAINDER OF SUB-BASIN		gallons / day
TOTAL AVERAGE DAILY FLOW TO PUMP STATION		gallons / day
PEAKING FACTOR USED		
PEAK FLOW TO PUMP STATION		gallons / day

SYSTEM HEAD CURVE

FORCE MAIN DISCHARGE CENTER LINE ELEVATION			feet	
WET WELL MINIMUM WATER ELEVATION			feet	
WET WELL MAXIMUM WATER ELEVATION			feet	
FORCE MAIN DATA	NOMINAL DIAMETER		inches	
	ACTUAL I.D.		inches	
	LENGTH		feet	
	FRICTION FACTOR HAZEN WILLIAMS "C"		NEW PIPE CONDITION	
			AGED PIPE CONDITION	
	CALCULATED VELOCITY		ft/s, Minimum	
			ft/s, Maximum	
ELEVATION OF FORCE MAIN HIGH POINTS (feet)				

FULTON COUNTY

FULTON COUNTY PUBLIC WORKS
PUMP STATION DESIGN CALCULATION FORM

PROJECT NAME:		DATE
PROJECT NUMBER:		
PROJECT ADDRESS:		REVIEW No.:
DEVELOPMENT NAME:		
LAND LOT:	DISTRICT/SECTION:	
ENGINEER NAME:		
ENGINEER PHONE & EMAIL:		REVIEWED BY:
CONTRACTOR/DEVELOPER NAME:		
CONT./DEV. PHONE & EMAIL:		

WET WELL

WET WELL SIZE	DIAMETER, ft			
	LENGTH, ft		WIDTH, ft	
	AREA, sq. ft			

WET WELL ELEVATIONS	TOP		feet
	BOTTOM		feet
	GRAVITY SEWER INLET		feet
	FORCE MAIN		feet
	ALL PUMPS OFF ELEVATION		feet
	LEAD PUMP ON		feet
	LAG PUMP ON		feet
	HIGH LEVEL		feet
	GRAVITY SEWER SPILL		feet
WET WELL ACTIVE STORAGE VOLUME		gallons	
DURATION OF EMERGENCY STORAGE		hours	

FULTON COUNTY

FULTON COUNTY PUBLIC WORKS PUMP STATION DESIGN CALCULATION FORM		
PROJECT NAME:		**DATE**
PROJECT NUMBER:		
PROJECT ADDRESS:		**REVIEW No.:**
DEVELOPMENT NAME:		
LAND LOT:	DISTRICT/SECTION:	
ENGINEER NAME:		
ENGINEER PHONE & EMAIL:		**REVIEWED BY:**
CONTRACTOR/DEVELOPER NAME:		
CONT./DEV. PHONE & EMAIL:		

BY SIGNING THIS FORM, THE ENGINEER OF RECORD CERTIFIES THAT IT IS COMPLETE AND ACCURATE AND SATISFIES ALL REQUIRMENTS OF THE FULTON COUNTY PUBLIC WORKS "SANITARY SEWER PUMP STATION AND FORCE MAIN DESIGN GUIDELINES"

ENGINEER OF RECORD

NAME (print) ______________________________

SIGNATURE ______________________________

P.E. LICENSE No. ______________________________

DATE ______________________________

FULTON COUNTY

FULTON COUNTY DEPARTMENT OF PUBLIC WORKS FORCE MAIN DESIGN PLAN CHECKLIST

The engineer is referred to the Fulton County Public Works "Sanitary Sewer Pump Station and Force Main Design Guidelines" for general information on the preparation of force main.

This checklist is intended to be a guide in preparing Force Main Plans. This checklist is not all encompassing. It is left to the Engineer's discretion to decide what additional information may be needed to complete the plans.

ALL SHEETS

☐	Final plans shall be on **22"x34"** paper sheets and in PDF electronic Format.
☐	Each sheet except the cover sheet shall have a title block in the lower right corner containing: ☐ Project name. ☐ Project number (if Fulton County project) ☐ Sheet number ☐ Total number of sheets ☐ Scale ☐ Drawer's, Designer's, and Checker's initials and date. ☐ Date (month/day/year)
☐	All sheets shall be sealed, signed and dated by a Registered Civil Engineer in the State of Georgia

COVER SHEET

The Engineer shall provide a cover sheet with the following information:

☐	Project name
☐	Drawing Index which provides sheet number and a description of the corresponding sheet
☐	Table of Quantities such as Pipe, valves, F.H.'s, meters, services etc.
☐	Vicinity map
☐	District and Land Lot number
☐	Engineering firm's name, address and telephone number
☐	Developer's name, address and telephone number
☐	Date (month/day/year)
☐	Signature Approval Blocks

SHEET 2

The Engineer shall provide a general sheet containing the following information:

FULTON COUNTY DEPARTMENT OF PUBLIC WORKS FORCE MAIN DESIGN PLAN CHECKLIST	
☐	General notes covering important parameters as outlined in the Fulton County Design Guidelines for Sanitary Sewer Pump Stations and force mains.
☐	Other notes as necessary to cover situations **not** covered by the Design Guidelines or by the FCPWStandard Details.
☐	Legend showing symbols and line types used within the drawings.
☐	Engineering's firm title block containing firm's name, address, and phone number.
☐	Elevation datum and benchmark information in Georgia State Plane Coordinates.
☐	Note to be shown on plan: **Contractor shall notify Fulton County Public Works Inspector forty eight (48) hours prior to start of construction.**
PLAN & PROFILE SHEETS	
☐	Plan view shall show proper scale. Scale shall not be more than: Plan: 1 inch = 50 feet Profile: Horizontal – 1 inch = 50 feet Vertical – 1 inch = 10 feet
☐	Plan view shall show the following: ☐ All streets, alleys and easements. They shall be dimensioned at least once and at breaks. Streets shall be identified by name. ☐ All abutting lots shall be identified by lot number, tract and subdivision. ☐ All topography within and to at least five (5) feet beyond easements and topography affected by construction shall be shown. ☐ Location of all above and underground utilities, including water mains, storm and sanitary sewers, dry wells, buried telephone lines, natural gas, power and cables. Existing utilities shall be shown as dashed lines or faded lines with type, size and other available information called out. ☐ All structures, paving, and other topographic features within vicinity, such as trees, shall be shown and identified by name, size and type. ☐ Location of proposed fittings and appurtenances shall beshown and identified by name, size, and type. ☐ Location of all existing and proposed easements. ☐ Location of all existing benchmarks shall be shown and identified by type. ☐ Location of all connections to existing sewer with fittings clearly labeled and method of connection specified. ☐ Show bearings, curve information and stationing. ☐ Location of soil boring holes. ☐ All sheets shall have a north arrow orienting the plan view. Profile view shall show the following:

FULTON COUNTY DEPARTMENT OF PUBLIC WORKS FORCE MAIN DESIGN PLAN CHECKLIST	
	☐ Profiles are required for all force mains crossing stream bed or Georgia Department of Transportation right-of-way.
	☐ Existing utilities which cross the proposed utility. Identified crossing utility by name, size, type of piping, location (station) and elevation. Location and elevation are to be obtained from 'as-built" plans paying particular attention to any differences in datum. **NOTE:** ***All existing underground utilities shown on profile are assumed to be shown in approximate location only*** ☐ Show proposed and existing grade line. ☐ All appurtenances such as valves, vaults, fittings and restraints. Identify by name, size, type, station and elevation. ☐ All sheets shall show match lines labeled as such with station and sheet number. ☐ Proposed Force Main shall be shown as solid lines with sizes, material, and pipe classes called out. For example: 8 inch DIP (Water Main) – Class 51
DETAIL SHEETS	
☐	Include Fulton County Standards Details to be used on the project.
☐	Include any other details specific to the project that are not covered by Fulton County Standard Details.
☐	Detail sheets shall be located at the end of the plan set and referenced where used.

FULTON COUNTY

FULTON COUNTY DEPARTMENT OF PUBLIC WORKS
ENGINEER'S CERTIFICATE CONSTRUCTION COMPLETION FORM

DATE: ______________________________

PROJECT NAME: ______________________________

LAND LOT: ______________________________ **DISTRICT:** ______________

This is to certify that ______________________________

Have (has) been graded to within three (3) inches of the final grade, to conform to profile grade approved by Fulton County Public Works.

That street(s) is (are) graded to proper width to allow for an eight (8) foot shoulder on each side of the curb. The shoulder is within three (3) inches of final grade.

That the proper catch basins have been erected and the proper drainage facilities installed.

That sewers and sewer services have been installed.

That proof/documentation of 95% compaction has been provided as required.

That if easements are involved, they are within three (3) inches of final grade.

That no force mains will be laid until center line stakes have been installed and materialsinspected and approved by Construction Project Manager**.**

COMMENTS: ______________________________

____

Signed: ______________________________ **Date Approved:** ______________
Developer's/Contractor's Engineer of Record

______________________________ ______________________________

FCPW Development Engineer **FCPW Chief Construction Manager**

NOTE: Submit completed Engineer's Certificate to the Fulton County Public Works.

FULTON COUNTY PUBLIC WORKS

PUMP STATION AND FORCE MAIN STARTUP-READINESS CERTIFICATION

PROJECT NAME:		DATE
PROJECT NUMBER:		
PROJECT ADDRESS:		REVIEW No.:
DEVELOPMENT NAME:		
LAND LOT:	DISTRICT/SECTION:	
ENGINEER NAME:		
ENGINEER PHONE & EMAIL:		REVIEWED BY:
CONTRACTOR/DEVELOPER NAME:		
CONT./DEV. PHONE & EMAIL:		

WET WELL

The Engineer and Contractor/Developer shall certify that the following is completed to the satisfaction of FCP

- ☐ All sewer, pump station, and force main designs were completed and reviewed and approved by FCPW
- ☐ The Engineer and Contractor/Developer shall have received all approvals from EPD, if required.
- ☐ The Engineer and Contractor/Developer shall have provided accurate and stamped as-builts.
- ☐ A Force Main Test must be completed and accepted.
- ☐ A pump draw down test must be completed and accepted.
- ☐ A certified of compaction from a licensed Geotechnical Engineer must be completed and accepted.
- ☐ The General Contractor/Developer, Electrical Contractor, and Pump Manufacturer personnel must be scheduled to be on site at Start-up.
- ☐ All utilities (i.e. – electric, water, communications, and gas, if applicable) must be installed and working at Start-up.
- ☐ Telemetry/remote monitoring system shall be functional.
- ☐ Submersible pumps will need to be pulled out of the wet well at Start-up. (The General Contractor is responsible for this.)
- ☐ Pumps must be able to run off of the main power source, as well as off of the generator.
- ☐ All spare parts, O&M Manuals, and applicable paperwork should be brought to Start-up unless provided in advance.

THE ABOVE ITEMS MUST BE COMPLETE PRIOR TO SCHEDULING A START-UP.

When this check off list is complete, it will need to be provided to FCPW.

The desired Start-up date should be listed along with a contact name and phone number. If all the items are complete, you will be contacted with a Start-up date and time. It is understood that some items may require onsite review and approval prior to the "Startup." These will be coordinated through the designated FCPW PM.

FULTON COUNTY

FULTON COUNTY PUBLIC WORKS PUMP STATION AND FORCE MAIN STARTUP-READINESS CERTIFICATION	
PROJECT NAME:	DATE
PROJECT NUMBER:	
PROJECT ADDRESS:	REVIEW No.:
DEVELOPMENT NAME:	
LAND LOT: DISTRICT/SECTION:	
ENGINEER NAME:	
ENGINEER PHONE & EMAIL:	REVIEWED BY:
CONTRACTOR/DEVELOPER NAME:	
CONT./DEV. PHONE & EMAIL:	

SIGNATURES BELOW CONFIRMING THE ABOVE IS COMPLETED

ENGINEER OF RECORD

NAME (print) ______________________________

SIGNATURE ______________________________

P.E. LICENSE No. ______________________________

DATE ______________________________

DEVELOPER / CONTRACTOR

NAME (print) ______________________________

SIGNATURE ______________________________

DATE ______________________________

FULTON COUNTY PUBLC WORKS WASTEWATER AS-BUILT CHECKLIST		
Project Name:		
Project Address:		
Reviewed by:		**Date:**

General Information

General

☐	Show name, address and phone number of engineering/surveying firm.
☐	Show name, address and phone number of force main contractor.
☐	Show name, address and phone number of owner/developer.
☐	Submit 2 sets of **22" x 34"** as-built drawings, AutoCAD file and electronic signed sealed PDF on a flash drive.
☐	Plans must bear an original hand written signature and date across the seal of a Registered Land Surveyor licensed in the State of Georgia.
☐	Show the following on all plans: • North arrow • Location map • Graphic scale • Benchmark information in State Plane Coordinates
☐	Specify project title, project number (if Fulton County Project), land lot, district, and parcel number in thetitle block.
☐	Show name of development with all name changes.
☐	Show, label and station fire hydrants, valves and fittings.
☐	Label pipe size and type for each section of line.
☐	Show, label and number all manholes including station numbers.
☐	Show stub locations for each lot with station numbers from manholes, lengths and depths.
☐	Label all abutting lots by lot number, tract, subdivision an address.
☐	Show and label roads, right-of-way and pavement widths.
☐	Submit a copy of the site plan or final plat.
☐	Show and label all property boundaries, roads, right of ways with dimensions, all utility easements, phase lines, buffers and adjoining property owners.
☐	Provide State Plane Coordinates for all valve locations.
☐	Provide a material list shown on as-built drawing indicating the number of valves and size/length/type of pipes.

FULTON COUNTY PUBLC WORKS WASTEWATER AS-BUILT CHECKLIST		
Project Name:		
Project Address:		
Reviewed by:		**Date:**

☐	Show and label all permanent easement with Book and Page Number. Provide easement documents for all easement and provide a letter signed and sealed by a Registered Land Surveyor licensed in the State of Georgia, stating they have all been addressed or that there are none.
☐	**Include a copy of the checklist with re-submittal.**

FULTON COUNTY PUBLIC WORKS CONSTRUCTION MANAGEMENT			
RELEASE FOR FORCE MAIN CONSTRUCTION			
DATE:			
PROJECT NAME:			
WR#:			
LAND LOT:		**DISTRICT:**	
DEVELOPER:			
CONTRACTOR:			

☐	Copy of Contractor's Insurance		
☐	**Compaction Test**	**DATE:**	
☐	Engineer's Certificate	**DATE:**	
☐	Invoice / Packing Slip		
☐	Copy of Labor Agreement		
☐	D.O.T. / R&D permit if required		
☐	Inspector's Certification of Materials		
DATE:		**INSPECTOR:**	

When the above items are approved and/or on file. Force Main construction is thereby authorized to begin.

FULTON COUNTY PUBLIC WORKS
REQUEST FOR EXCEPTION/CHANGE TO PUMP STATION FORM

Date:____

Requested By: ____

Company Name: ____

Contact Phone Number:_________________**Fax Number:** ______________________

The following exception/change is requested at______________________________
Pump Station.

Station is:______**New**________**Upgrade**

Description: ____

Purpose for change: ____

FULTON COUNTY PUBLIC WORKS
REQUEST FOR EXCEPTION/CHANGE TO PUMP STATION FORM

Detail Attached:___Yes______No

Date of Stamped Plans:__________Station:_________Force Main: ______

Page #_____Page #______Page #______Page # _____

Engineer has been consulted:________Yes
__________________________No

Engineer's name:________________________Contact phone number: ___________

Date of consult: _____________

Engineer agrees to show any and all changes on as-builts.

Engineer's Signature: ___________________

Pump Station Trade Manager Initial to request: ______________

Accepted by:___________________________________Date:_____________________

Must be signed by the Distribution/Collection Division Director or authorized designee

GEORGIA DEPARTMENT OF TRANSPORTATION CHECKLIST	
To obtain a Georgia Department of Transportation Utility Encroachment Permit, please contact the FultonCounty Public Works Technical Service Division with the following information:	
☐	Right-of-Way Width
☐	Pavement Centerline and Width
☐	Distance to Curb
☐	North Arrow
☐	Location of proposed installation showing distances to nearest intersecting street
☐	Length, size and type of utility
☐	Bore and Jack Pits (if required)
☐	Show posted speed limit
☐	Include an 8 ½ x11 map of location

FULTON COUNTY

GEORGIA DEPARTMENT OF TRANSPORTATION MINIMUM INFORMATION REQUIRED FOR GUPS UTILITY PERMIT APPLICATION	
I.	**GENERAL PERMIT INFORMATION**
☐	1. State Route number or County Route/City Street number when permitting/adding facilities within a GDOT programmed project. (Note: Project permits will be submitted by the project identification (PI) number and this information will automatically populate)
☐	2. County. (GUPS interactive map allows search by county to confirm boundaries)
☐	3. Verify access control. (Additional restrictions apply on limited access routes)
☐	4. Location. (GUPS will populate the milepost via the interactive map, need to field verify)
☐	5. Assure Traffic Control (TC) is in accordance with current Manual on Uniform Traffic Control Devices **(MUTCD)**. Confirm a typical application shown in part 6 of the MUTCD will work with field conditions,if not, select and upload detailed TC plan. Any work done on the interstate or Limited Access Highway requires a detailed TC plan.
☐	6. Description of proposed utility work.(Provide details – Size, type, and length including <u>method of installation</u>, and note if it is replacement, maintenance, reconducting, etc. type work, when applicable)
☐	7. For aerial proposals, field verifies that there are no facilities that require transfer or removal of existing facilities on the entire route covered by this permit within that County. If transfers and/or removal are determined, they will be required to be performed under this permit. Pole transfer data information will need to be filled out and proposed plan submitted.
☐	8. If blasting is required with permit, a supplemental form (DOT 8413X-Blasting Permit & Procedures Form) will need to be submitted with the general permit.
☐	9. Provide legend, if applicable or required.
☐	10. If project list that is populated by GUPS reflects project is UC (under construction) or close to letting, a coordination letter from prime contractor and utility adjustment schedule (UAS) when permit request is inside GDOT project under construction is required.
II.	**DETAILS REQUIRED IN SUPPORTING DOCUMENTS** Confirm supporting documents are legible when printed at 8 ½” X 11” or 11” X 17”. NO DWG FILES ACCEPTED.
	A. EXISTING FIELD CONDITIONS
☐	1. Dimensions of the roadbed – Must be English units. a. Pavement width. (Indicate centerline, curb & gutter or edge of pavement (EOP)) b. Distance to shoulder point, ditch and/or toe of slope. c. Show grass/concrete median and sidewalk, if applicable.
☐	2. Right of way width. (Note: If r/w varies you will need to indicate these changes and not use the word “varies”)
☐	3. North Arrow.
☐	4. Show location of traffic signals, if exists.
☐	5. Location of all above and below ground structures to be navigated. (I.e. storm drain, culverts, bridges, existing utilities, walls, parking lots, buildings, driveways, side streets, signal, etc.)
☐	6. Test holes are required when boring under or over existing facilities/structures. Show test hole locations and size with details on existing facility/structure.

FULTON COUNTY

GEORGIA DEPARTMENT OF TRANSPORTATION MINIMUM INFORMATION REQUIRED FOR GUPS UTILITY PERMIT APPLICATION	
☐	7. Posted speed limit.
☐	8. Local Street names for state route and side streets shown.
☐	9. Note unpaved roads and if driveways are paved or dirt.
☐	10. Clearly identified and differentiate existing and proposed facilities in legend.
	B. DETAILS ON PROPOSAL
☐	1. Distance to proposed facility from right of way, edge of pavement and face of curb where curb exist.
☐	2. Depth of cover of proposed facility noted at back-slope, ditches, shoulders and pavement.
☐	3. Location of proposed installation showing distances to nearest intersecting street or milepost.
☐	4. Length, size, type of proposed utility, and distance between proposed structures.
☐	5. Detailed distances for offset portions of installation from right of way.
☐	6. **Boring (Detailed profile)** a. Type and length of bore. b. Length, size and type of casing, if applicable. (see #11) c. Bore pits – location dimensioned from edge of pavement, size and vertical difference from bottom of pit to EOP. Bore pits are to be minimum 1' to 1' ratio from EOP (for every 1' in depth 1' from EOP) or minimum of 10' from EOP, whichever is greater. d. Outside diameter of bore and outside diameter of facility being proposed. e. Shoring details if applicable. f. Plot existing facility/structure to be navigated. g. Depict right of way, ditches, pavement, etc. h. Special Provision for directional bore on limited access routes (Directional Boring under Interstate and Limited Access Highways).
☐	7. Pavement cuts – note jurisdiction, dimension, location from EOP and known travel lanes, size and method of repair. Note limits of mill and inlay if applicable. (Depends on age of existing pavement, please contact District Utilities Office for information).
☐	8. Method of installation. **(To choose multiple methods in GUPS, hold CTRL +click the additional methods.)**
☐	9. Detailed explanation for any installation other than in back five feet of the right of the right of way. **(Note on drawing why facilities cannot be located in the back five feet r/w or include exception letter if under pavement.)**
☐	10. Location of proposed fire hydrant, manholes, etc., including distance from pavement and right of way.
☐	11. Casing required when facility has "wash" factor (i.e., water, sewer, petroleum) or in the area of existing structures (bridges, culverts).
☐	12. Profile for all road crossings.
☐	13. Length and width of clearing.

FULTON COUNTY

	GEORGIA DEPARTMENT OF TRANSPORTATION MINIMUM INFORMATION REQUIRED FOR GUPS UTILITY PERMIT APPLICATION
☐	14. Interstate crossing shown on GDOT construction plans.
☐	15. Note whether company forces or sub-contractor will be used. (Special assurance form required for sub-contractor)
☐	16. Permit work required because access permit will be shown on GDOT approved permitted driveway drawings.
	C. ADDITIONAL INFORMATION FOR ABOVE GROUND FACILITIES
☐	1. Distance from edge of travel lane/face of curb for existing and proposed above ground facilities.
☐	2. Overhead clearance noted on profile for crossings at low point.
☐	3. Location of temporary poles or guy poles if applicable.
☐	4. Average daily traffic (ADT) volumes noted when clear zone must be evaluated.
☐	5. Indicate poles as new, replaced, or existing to remain.
☐	6. Cross-sections of the current terrain at the proposed above ground facility if above ground structures are inside clear zone. Cross-section to include slope ratios.
III.	**DETAILS REQUIRED FOR BRIDGE ATTACHMENTS** Bridge attachments will not be considered when, in the Department's judgment, practical alternative methods, including joint use of existing facilities, are available. (See sections 5.7 of UAM)
☐	1. Description. (e.g. 10" water main, four 6-inch diameter telephone conduits)
☐	2. The weight of the utility per foot including contents.
☐	3. The opening size required through end walls, back walls, and diaphragms.
☐	4. For water and sewer mains, the maximum diameter of the pipe bell or flanges.
☐	5. The hanger spacing with hanger details.
☐	6. Location on the bridge.
☐	7. Proposal shown on Department bridge plans.
☐	8. Anchor type and specifications.
IV.	**DETAILS REQUIRED FOR TUNNELS** See GDOT standard specifications section 555.
☐	1. Designed in compliance with AASHTO specifications for tunneling.
☐	2. Subsoil surveys, including the elevation of the water table and the classification and relative density of the soils from the ground line to 3 feet below the tunnel liner.
☐	3. Rock coring data, including rock type and core recovery, when applicable.
☐	4. Sequence of operation for dewatering where applicable.
☐	5. Shoring details if applicable.
☐	6. Survey of existing field conditions.
☐	7. Steel liner plates hot-dipped galvanized and bituminous-coated.

FULTON COUNTY

FULTON COUNTY PUBLIC WORKS
PRESSURE TEST FORM

Project Name:		**Sewer Main:**	☐	**ADDITIONAL COMPONENTS**	
Constructed by:		**Force Main:**	☐	**Number of Fire Hydrants =**	
		Water Main:	☐	**Total Feet of Copper ¾" and 1" =**	
Tap Address:				**Total Feet of Copper 1-1/2" and Larger =**	

PIPE LINE TEST RESULTS

Test Date	**Pipe**		**Station**		**Length**	**Start**		**End**		**Pressure Loss**	**Pass/Fail STATUS**
	Size	Type	From	To		Time	PSI	Time	PSI		

TAPPING SLEEVE AND VALVE TEST RESULTS

County Inspector:	**Signature:**	Date:

FULTON COUNTY

FULTON COUNTY DEPARTMENT OF PUBLIC WORKS PRESSURE TEST FORM	
COMMENTS:	

(Allowable Loss for Force Mains = Max 0 PSI over 2 hours.)

(Allowable Loss for Water Mains = Max 5 PSI over 2 hours.)

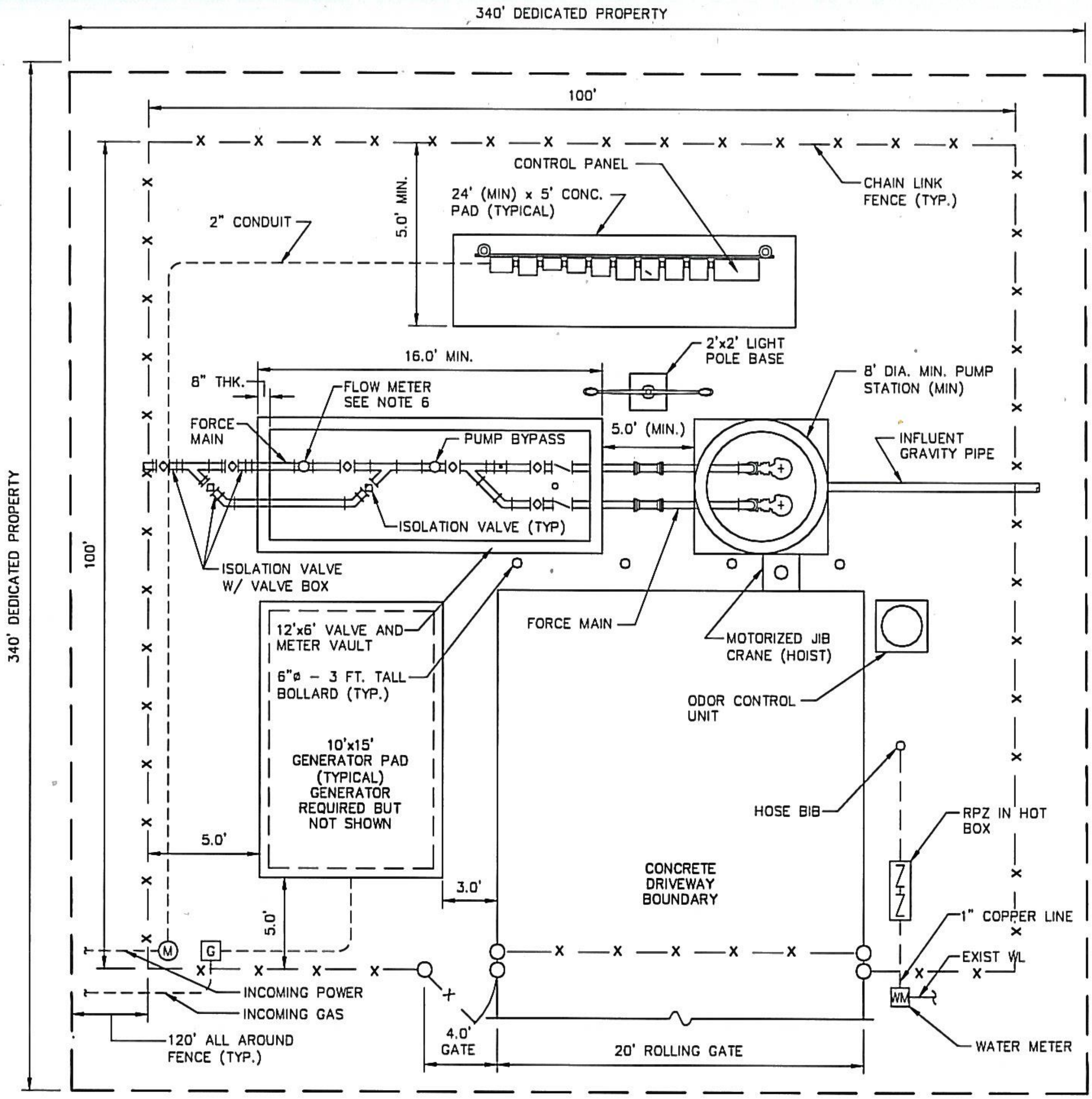
(Allowable Loss for Taps = Max 0 PSI over 30 minutes.)

(Allowable Loss for Sewer Mains = 1 PSI over 15 min.)

APPENDIX B

STANDARD DETAILS

STANDARD DETAILS LIST SANITARY SEWER PUMP STATION AND FORCE MAIN	
DETAIL NUMBER	**TITLE**
P-001	PUMP STATION SITE PLAN (TYPICAL/EXAMPLE)
P-002	PUMP STATION UNDERGROUND POWER DETAIL
P-003	PUMP STATION OVERHEAD POWER DETAIL
P-004	PUMP STATION HOSE BIB SERVICE CONNECTION DETAIL
P-005	PUMP STATION JIB CRANE (HOIST) BASE
P-006	PUMP STATION LIGHT POLE DETAIL
P-007	NOT USED
P-008	PUMP STATION SLAB AND CURB DETAIL
P-009	PUMP STATION GENERATOR PAD DETAIL
P-010	PUMP STATION FENCE AND GATE DETAIL
P-011	PUMP STATION NOISE WALL
P-012	PUMP STATION EXAMPLE ACCESS DRIVEWAY & TURN AROUND AREA
P-013	PUMP STATION TYPICAL DRIVE CROSS SECTION
P-014	PUMP STATION TYPICAL DETAIL MAXIMUM 50 HP PUMPS & 1 MGD FLOW
P-015	PUMP STATION COATING DETAIL
P-016	PUMP STATION CABLE DETAIL
P-017	PUMP STATION EXAMPLE OVERFLOW TANK
P-018	PUMP STATION COMBINATION AIR-VACUUM VALVE INSTALLATION DETAIL
P-019	ELECTRICAL LEGEND
P-020	PUMP STATION RTU CONNECTIONS
P-021	PUMP STATION BASIC CONTROL PANEL DETAIL RTU ALARM INPUTS
P-022	PUMP STATION GENERATOR TRANSFER SWITCH GENERATOR RUN ALARM
P-023	PUMP STATION TYPICAL POWER & CONTROL PANELS RACK (240V)
P-024	PUMP STATION EXAMPLE DUPLEX PUMP CONTROL BLOCK DIAGRAM (240V)
P-025	PUMP STATION TYPICAL POWER & CONTROL PANELS RACK (480V)
P-026	PUMP STATION EXAMPLE DUPLEX PUMP CONTROL BLOCK DIAGRAM (480V)
P-027	PUMP STATION EXAMPLE DUPLEX CONTROL PANEL ENCLOSURE DEAD FRONT LAYOUT
P-028	PUMP STATION EXAMPLE PROCESS & INSTRUMENTATION DIADRAM
P-029	PUMP STATION EXAMPLE SITE GROUNDING PLAN

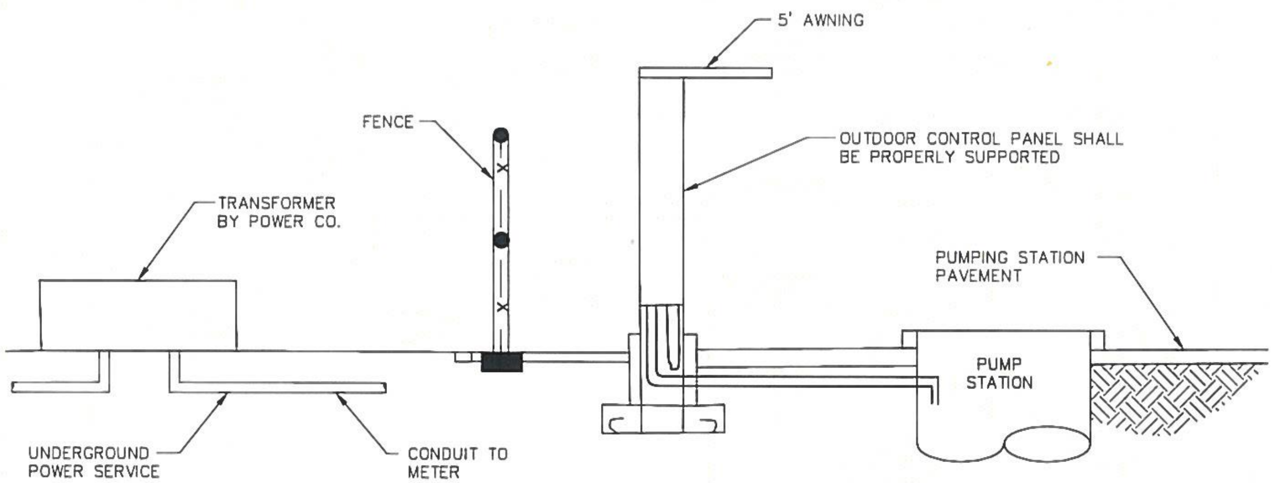


NOTES:

1. DETAIL IS EXAMPLE SITE PLAN. SIZES ARE RELATIVE AND BASED ON MINIMUM CRITERIA. LARGER WET WELLS, VALVE VAULTS, ETC. MAY BE REQUIRED BASED ON SITE CONDITIONS.
2. PUMP STATION PAD AND DRIVEWAY SHALL INCLUDE EXPANSION JOINTS AS NEEDED.
3. PUMP STATION PAD, OVERFLOW VAULT TOP SLAB, AND DRIVEWAY REINFORCEMENT SHALL BE DESIGNED TO WITHSTAND 80,000 LB LOAD.
4. THE STATION NAME, UTILITIES I.D. NUMBER AND ADDRESS SHALL BE AFFIXED TO THE FRONT OF THE METER CABINET.
5. ELECTRICAL AND CONTROL PANELS SHALL BE PROVIDED WITH A CANOPY WITH LED LIGHTING. SIZE OF THE CANOPY SHALL BE 5 FT WIDE AND 8 FT HIGH WITH THE LENGTH TO BE DETERMINED BY THE TOTAL COMBINED LENGTH OF ELECTRICAL AND CONTROL PANELS.
6. FOLLOW FLOW METER MANUFACTURER'S RECOMMENDATION FOR MINIMUM UPSTREAM AND DOWNSTREAM STRAIGHT PIPE DISTANCE FROM FLOW METER.
7. 20 FEET EASEMENT ALONG THE FORCE MAIN TO BE DEDICATED TO FULTON COUNTY.

FULTON COUNTY	FULTON COUNTY STANDARD DETAILS	DATE: 12-21-2021
	PUMP STATION SITE PLAN (TYPICAL / EXAMPLE) NOT TO SCALE	FULTON COUNTY PUBLIC WORKS 141 PRYOR ST. ATLANTA, GA. 30303 404-612-7400 FAX: 404-224-0498
		DETAIL NO. P-001

Revised: 12-28-2022 (3)

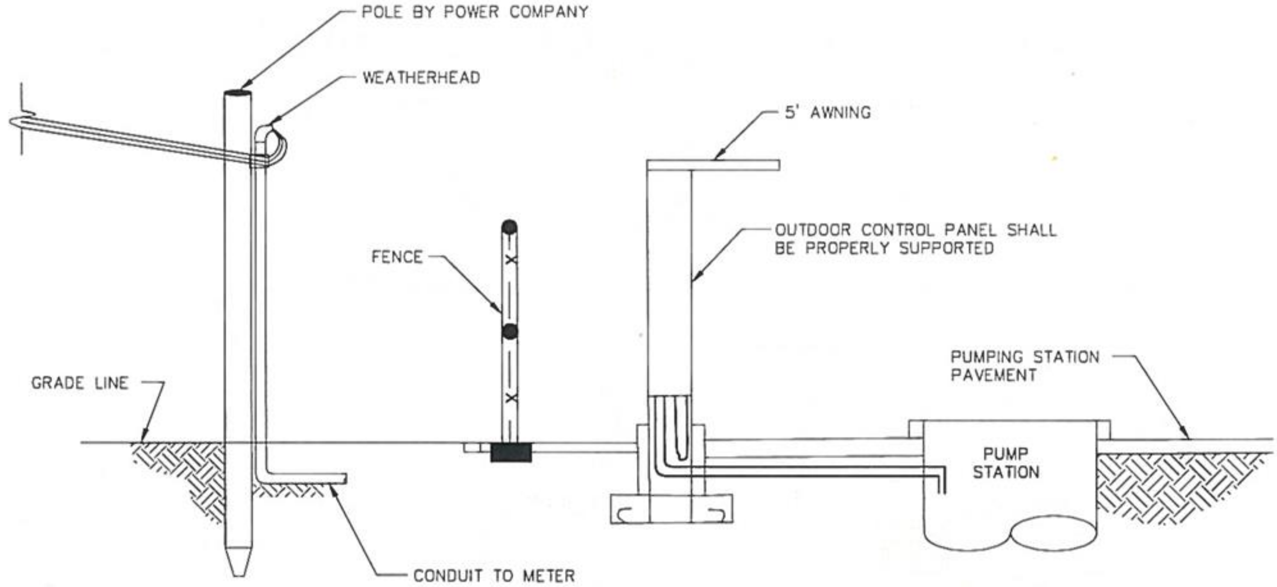


NOTES:

1. METER AND DISCONNECT SHALL BE PLACED NEAR THE FRONT ENTRANCE AS SHOWN ON P-001.

FULTON COUNTY	FULTON COUNTY STANDARD DETAILS	DATE: 12-21-2021
	PUMP STATION UNDERGROUND POWER DETAIL	FULTON COUNTY PUBLIC WORKS 141 PRYOR ST. ATLANTA, GA. 30303 404-612-7400 FAX: 404-224-0498
	NOT TO SCALE	DETAIL NO. P-002

Revised: 12-28-2022 (1)

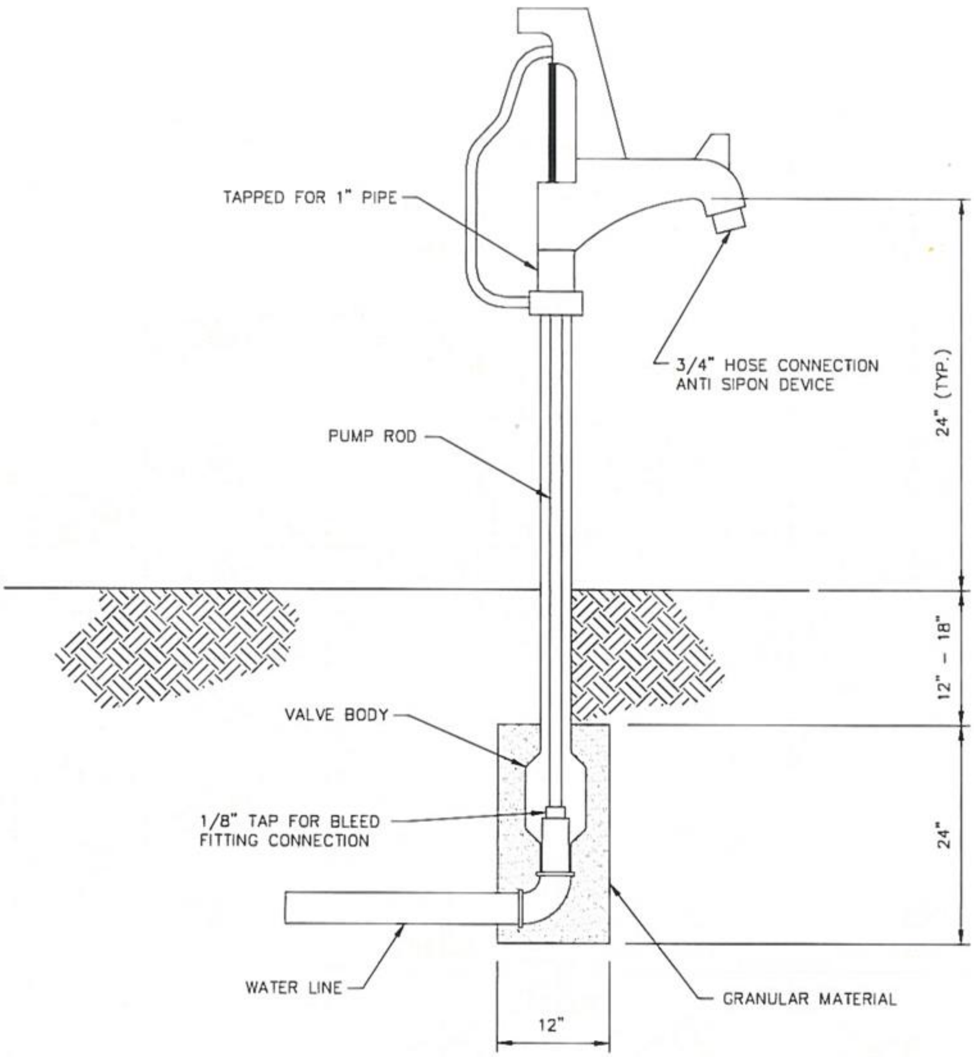


NOTES:

1. DISCONNECT SHALL BE PLACED ON ELECTRICAL/CONTROL PANEL SUPPORT (MAIN BREAKER IS SHOWN ON P–023 AND P–025).
2. DISCONNECT SWITCH MUST BE LOCKABLE IN EACH POSITION.
3. OVERHEAD POWER ONLY ALLOWED IF NOT PHYSICALLY POSSIBLE TO RUN SERVICE UNDERGROUND.

FULTON COUNTY	FULTON COUNTY STANDARD DETAILS	
	PUMP STATION OVERHEAD POWER DETAIL	FULTON COUNTY PUBLIC WORKS 141 PRYOR ST. ATLANTA, GA. 30303 404–612–7400 FAX: 404–224–0498
	NOT TO SCALE	DETAIL NO. P–003

Revised: 12–28–2022 (1)

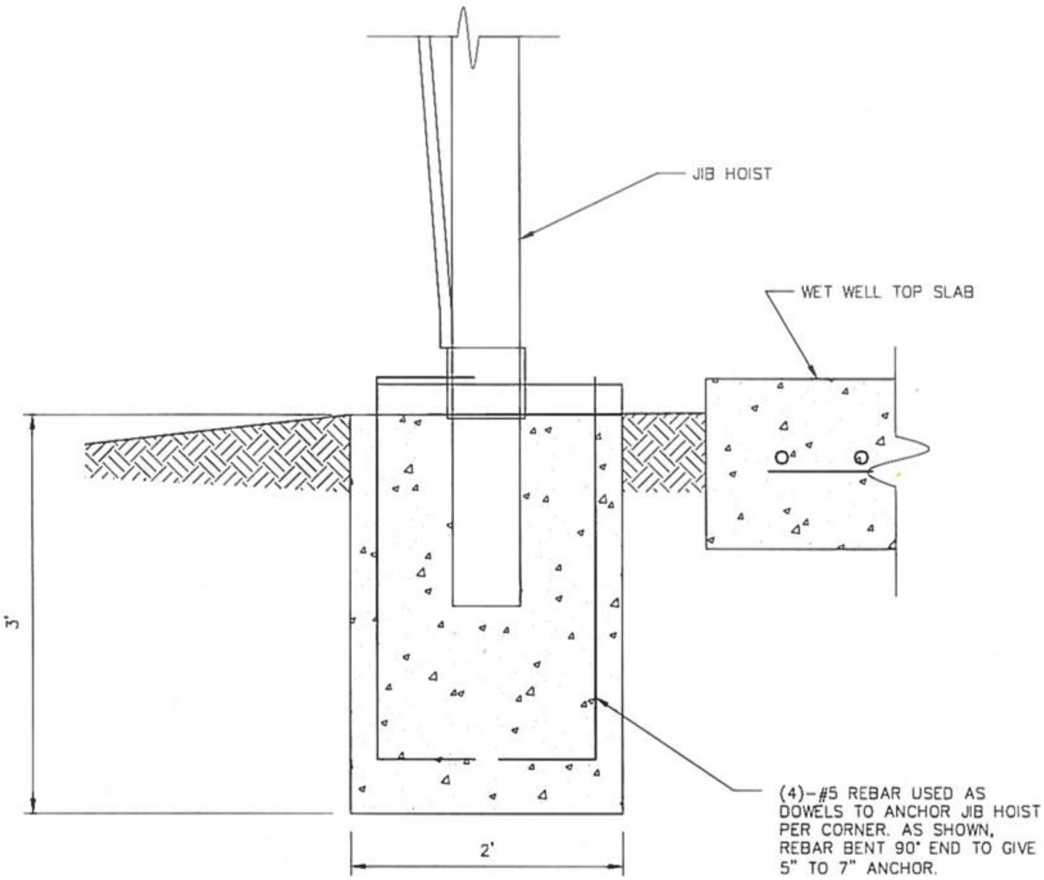


NOTE:

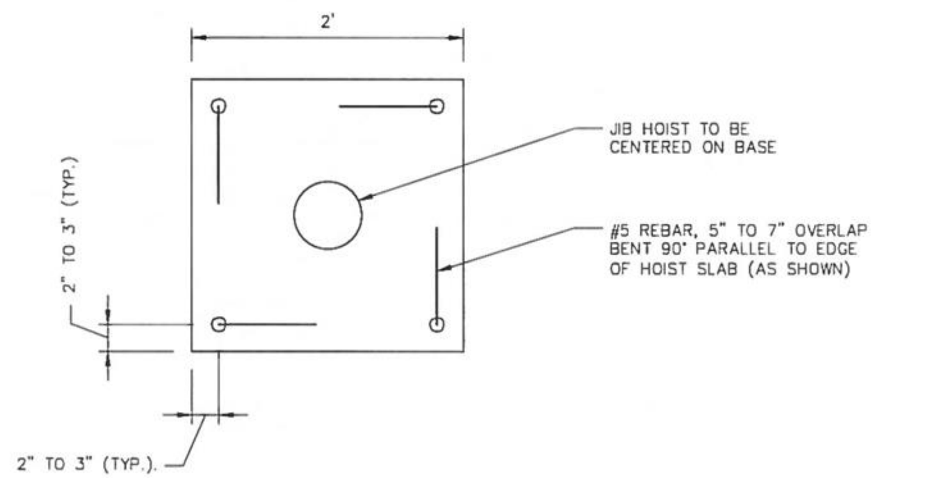
1. YARD HYDRANT TO BE SIMMONS 800 SERIES FREEZE PROOF OR APPROVED EQUAL.

FULTON COUNTY	FULTON COUNTY STANDARD DETAILS	DATE: 12-21-2021
	PUMP STATION HOSE BIB SERVICE CONNECTION DETAIL	FULTON COUNTY PUBLIC WORKS 141 PRYOR ST. ATLANTA, GA. 30303 404-612-7400 FAX: 404-224-0498
	NOT TO SCALE	DETAIL NO. P-004

Revised: 12-28-2022 (1)



PROFILE



PLAN

NOTES:

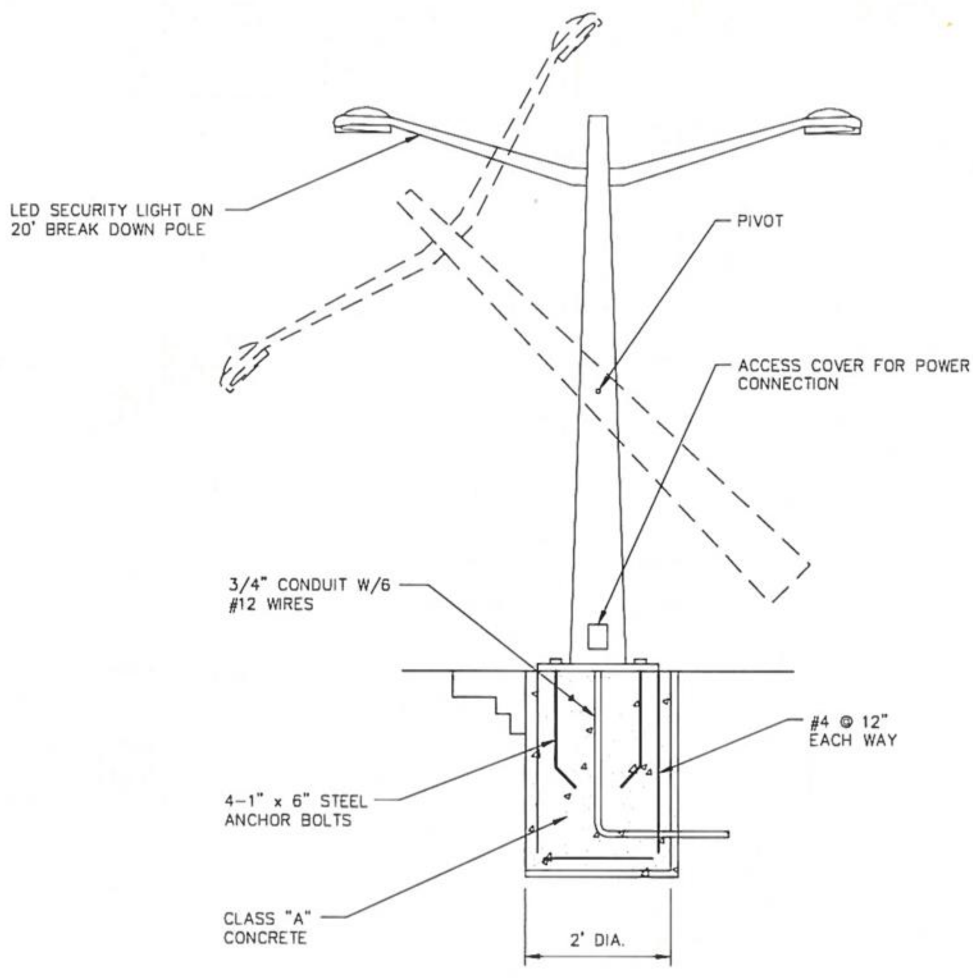
1. HOIST SIZE TO INCREASE AS NECESSARY FOR PUMP SIZE OR PER HOIST MANUFACTURER.

FULTON COUNTY	**FULTON COUNTY STANDARD DETAILS**	DATE: 12-21-2021
	PUMP STATION JIB CRANE (HOIST) BASE	FULTON COUNTY PUBLIC WORKS 141 PRYOR ST. ATLANTA, GA. 30303 404-612-7400 FAX: 404-224-0498
	NOT TO SCALE	DETAIL NO. P-005

Revised: 12-28-2022 (1)

NOTES:

1. EXTERIOR HINGED LIGHT POLE WITH 4900 LUMENS LED FIXTURE 120 VOLT PHOTOELECTRIC CONTROL, WITH HEAT AND IMPACT RESISTANT LENS. POLE IS TO BE ARCHITECTURAL BROWN AND IS TO BE SUPPLIED WITH LOWERING WENCH.
FIXTURE – GE PART # ERL1005C530EDKBZR
ER1 SHEILDS – GE PART # 93118695
BRACKET – GE PART # RBSU216PP
POLE – GE PART # ASHS202T-4.0-7PP
WINCH – GE PART # M180A



FULTON COUNTY

FULTON COUNTY STANDARD DETAILS

PUMP STATION
LIGHT POLE DETAIL

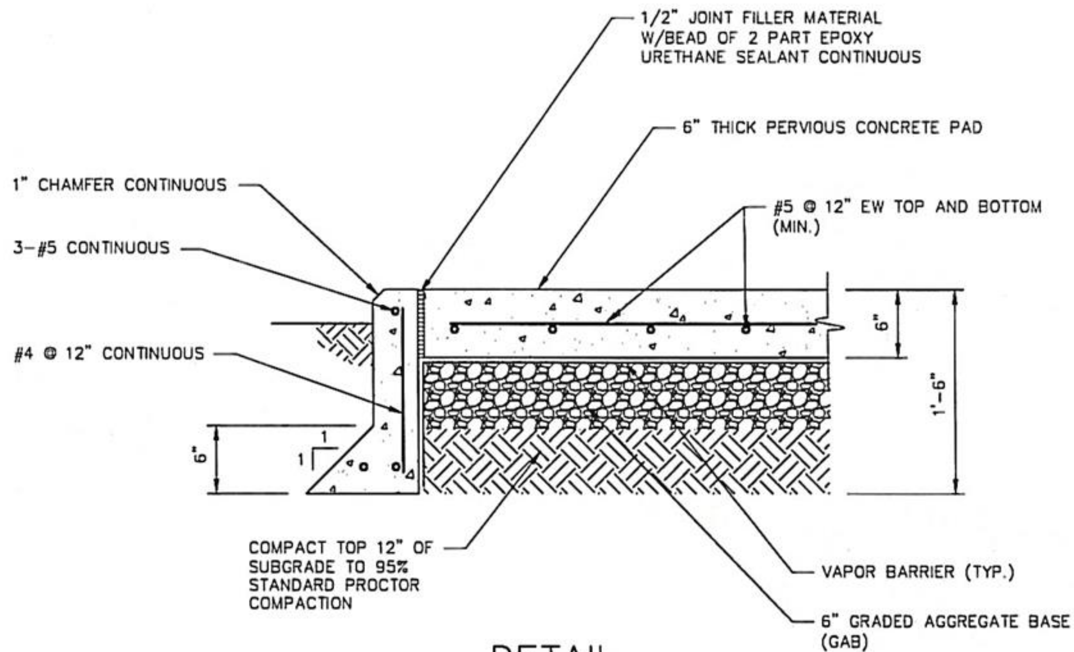
NOT TO SCALE

DATE: 12-21-2021

FULTON COUNTY PUBLIC WORKS
141 PRYOR ST.
ATLANTA, GA. 30303
404-612-7400
FAX: 404-224-0498

DETAIL NO. P-006

Revised: 12-28-2022 (1)



DETAIL

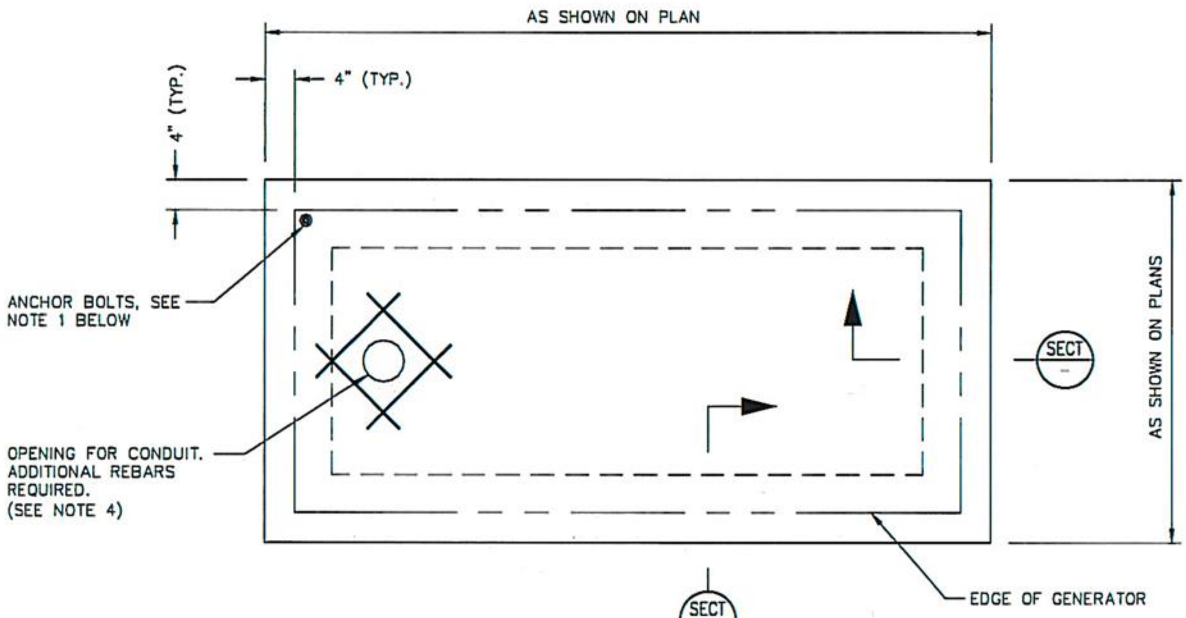
N.T.S.

NOTES:

1. PUMPING STATION CONCRETE PAD TO BE A MINIMUM OF 6 INCHES THICK ON A COMPACTED SUB-GRADE AND A MINIMUM 6 INCH AGGREGATE BASE COURSE COMPACTED TO 95% STANDARD PROCTOR COMPACTION.
2. PROVIDE CURBING, AS SHOWN, AROUND THE PAD TO PREVENT RUNOFF FROM FROM ERODING THE UNDERSIDE OF THE PAD.
3. PUMPING STATION PAD AND DRIVEWAY SHALL INCLUDE EXPANSION JOINTS AS NEEDED.
4. PUMPING STATION PAD AND DRIVEWAY REINFORCEMEINT SHALL BE DESIGNED TO WITHSATAND 80,000 LB LOAD.

FULTON COUNTY	**FULTON COUNTY STANDARD DETAILS**	DATE: 12-21-2021
	PUMP STATION SLAB AND CURB DETAIL	FULTON COUNTY PUBLIC WORKS 141 PRYOR ST. ATLANTA, GA. 30303 404-612-7400 FAX: 404-224-0498
	NOT TO SCALE	DETAIL NO. P-008

Revised: 12-28-2022 (1)

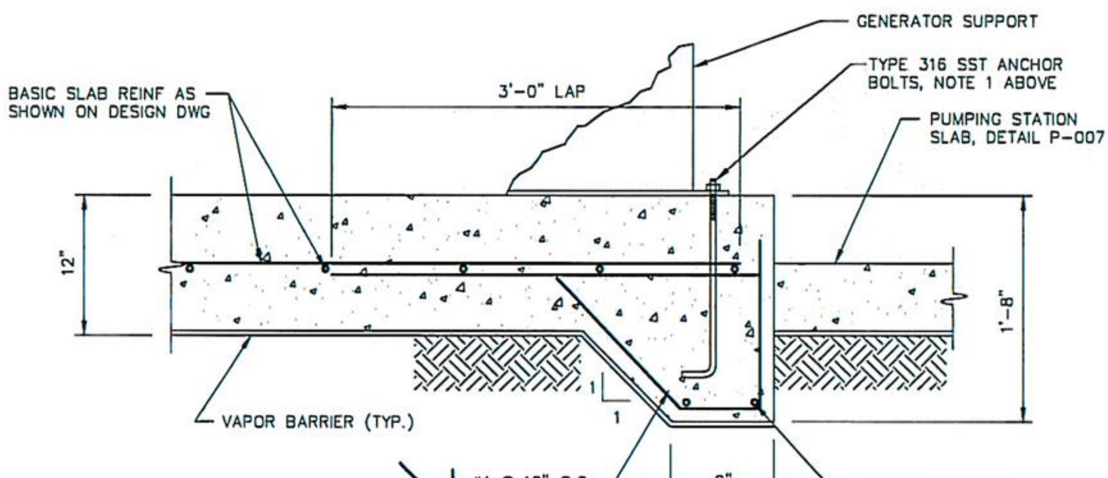


NOTES:

1. VERIFY QUANTITY, TYPE, DIAMETER AND LENGTH OF ANCHOR BOLTS REQUIRED BY MANUFACTURER PRIOR TO ORDERING AND/OR EMBEDDING FASTENERS IN CONCRETE SLAB.
2. PAD SIZE SHALL BE INCREASED AS NECESSARY.
3. CONTRACTOR TO COORDINATE SIZE AND LOCATION OF OPENING IN PAD FOR CONDUITS.
4. SIZE AND LENGTH OF REBARS TO BE DETERMINED BY DIAMETER OF CONDUIT OPENING.

PLAN

N.T.S.

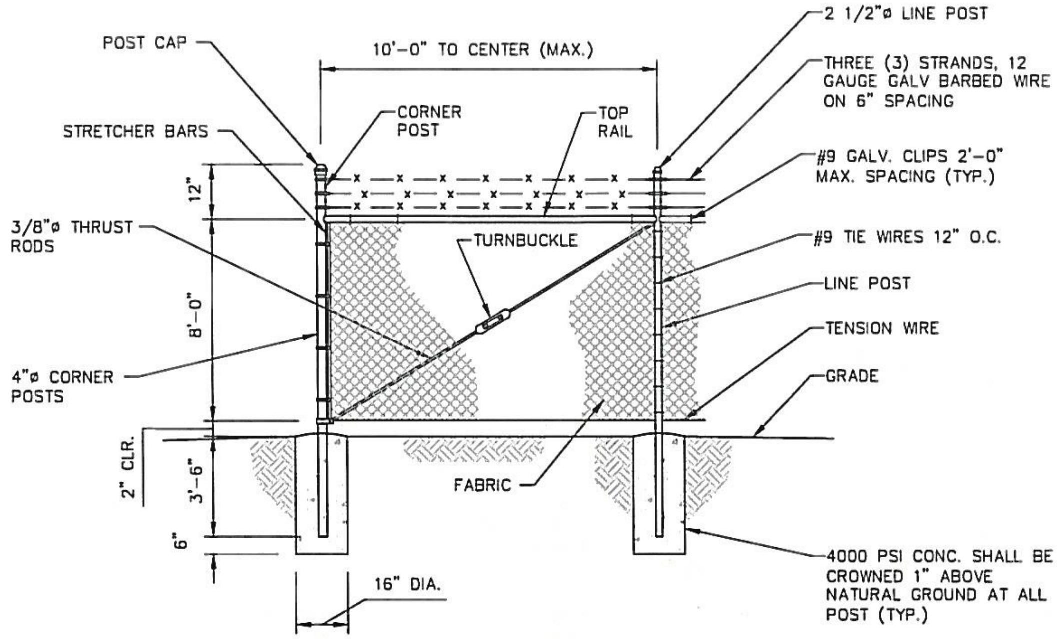


SECTION (TYP.)

N.T.S.

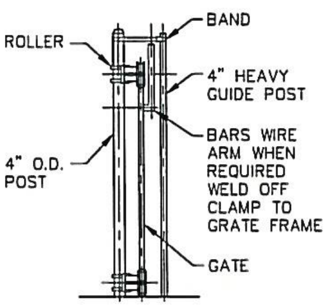
FULTON COUNTY	**FULTON COUNTY STANDARD DETAILS**	DATE: 12-21-2021
	PUMP STATION GENERATOR PAD DETAIL	FULTON COUNTY PUBLIC WORKS 141 PRYOR ST. ATLANTA, GA. 30303 404-612-7400 FAX: 404-224-0498
	NOT TO SCALE	DETAIL NO. P-009

Revised: 12-28-2022 (1)



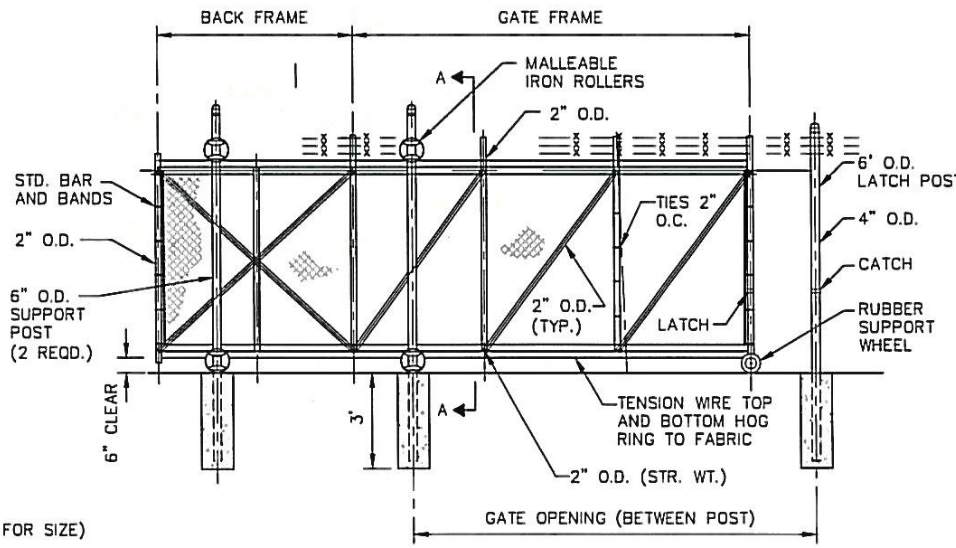
FENCING – CORNER DETAIL

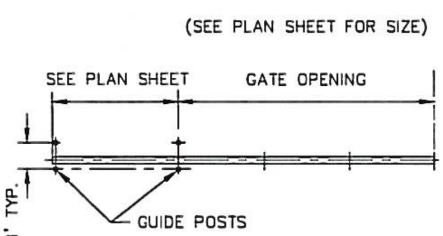
N.T.S.



SECTION A–A

N.T.S.





ROLLING GATE DETAIL

N.T.S.

PLAN VIEW

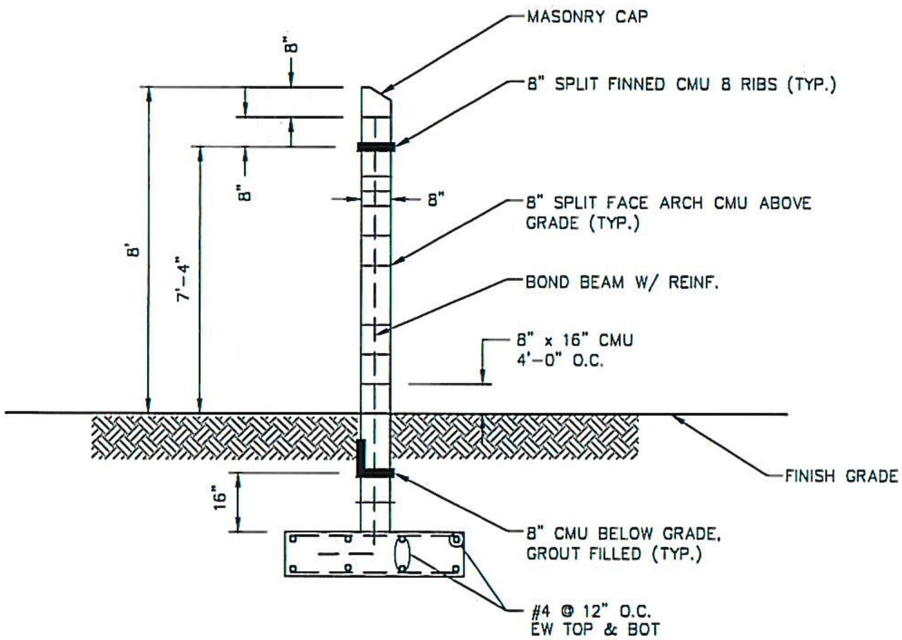
N.T.S.

NOTES:

1. THRUST RODS ARE REQUIRED FOR EACH GATE SECTION AND THE FIRST SPAN ON EACH SIDE OF A CORNER POST.
2. TOP LOCK HDPE FENCE SLATS ARE REQUIRED FOR ALL PUMPING STATION FENCES.
3. NUMBER 4 CHAINLINK WIRE FABRIC W/TOP RAILS.

FULTON COUNTY	FULTON COUNTY STANDARD DETAILS	DATE: 12-21-2021
	PUMP STATION FENCE AND GATE DETAIL	FULTON COUNTY PUBLIC WORKS 141 PRYOR ST. ATLANTA, GA. 30303 404-612-7400 FAX: 404-224-0498
	NOT TO SCALE	DETAIL NO. P-010

Revised: 12-28-2022 (1)



SECTION VIEW

N.T.S.

NOTES:

1. DEVELOPER TO PROVIDE WALL DESIGN DRAWINGS SIGNED AND SEALED BY A PROFESSIONAL ENGINEER.

FULTON COUNTY

FULTON COUNTY STANDARD DETAILS

PUMP STATION NOISE WALL

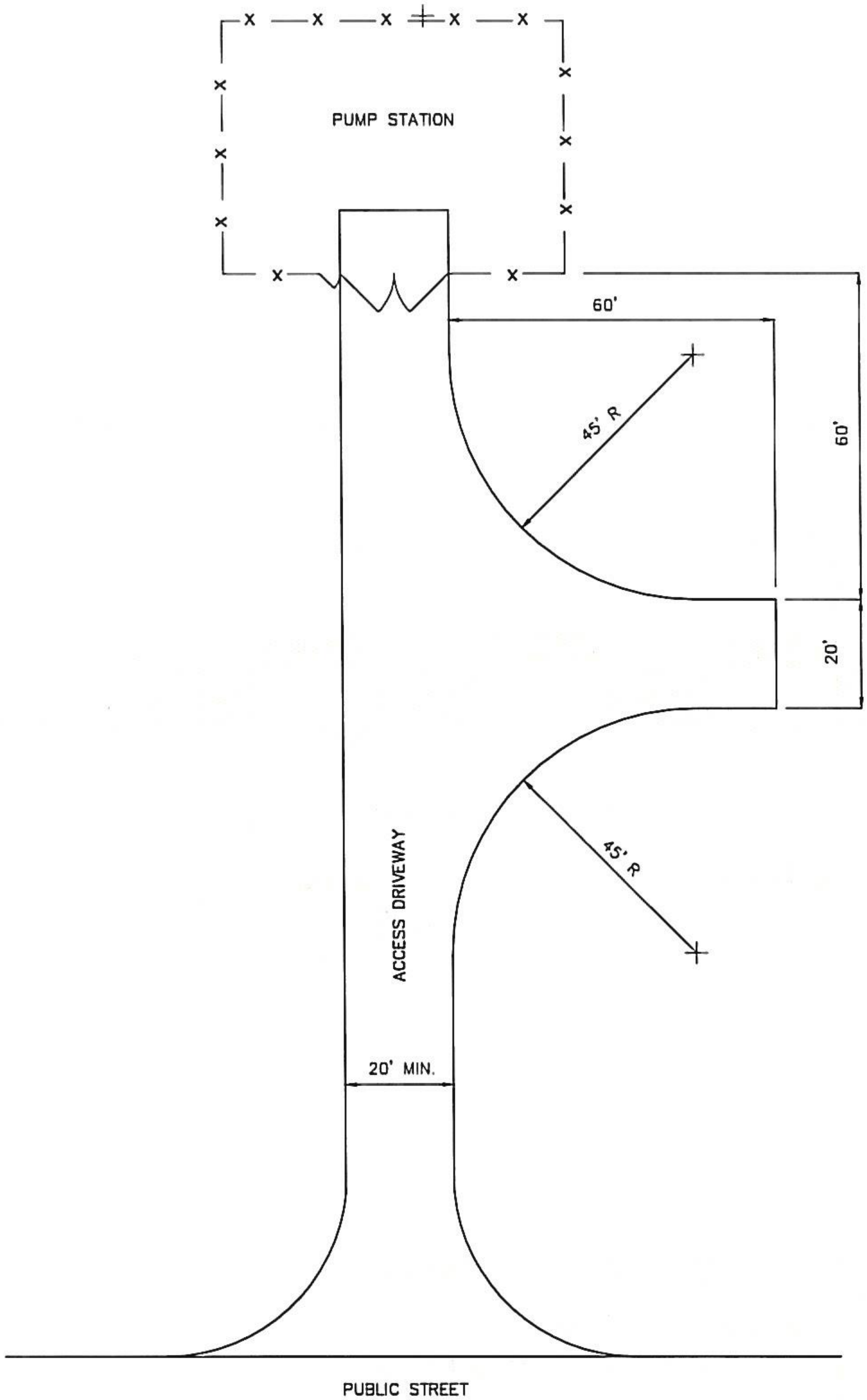
NOT TO SCALE

DATE: 12-21-2021

FULTON COUNTY PUBLIC WORKS
141 PRYOR ST.
ATLANTA, GA. 30303
404-612-7400
FAX: 404-224-0498

DETAIL NO. P-011

Revised: 12-28-2022 (1)

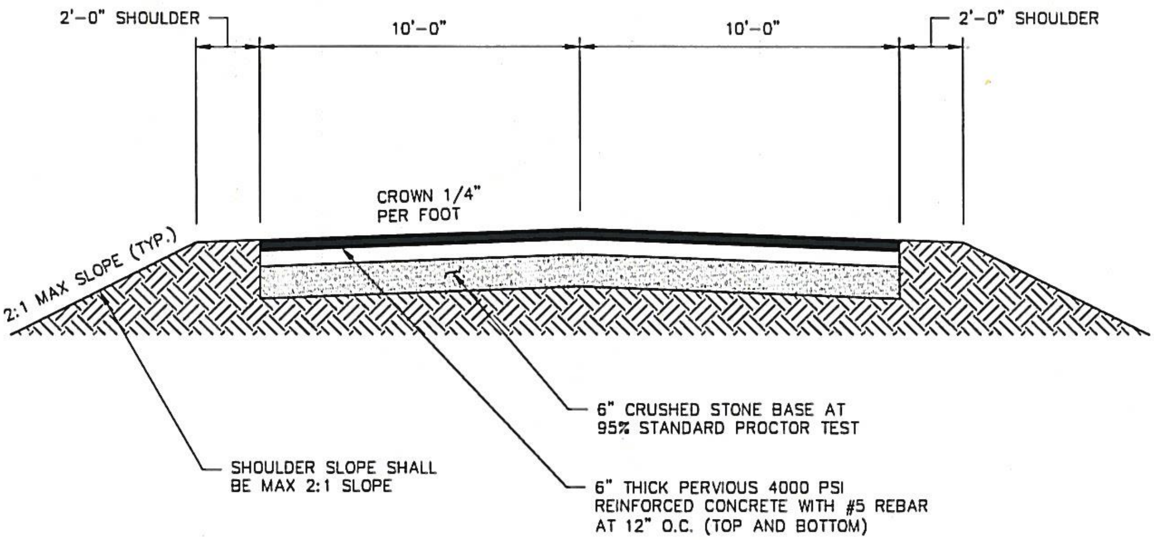


NOTES:

1. ENSURE THAT HAZMAT TRUCK MAY ENTER, BACK OUT, TURN AROUND AND EXIT PUMP STATION IN A SAFE MANNER.
2. ACCESS DRIVEWAY SHALL INCLUDE EXPANSION JOINTS AS NEEDED.
3. ACCESS DRIVEWAY REINFORCEMENT SHALL BE DESIGNED TO WITHSTAND 80,000 LB LOAD.

FULTON COUNTY	**FULTON COUNTY STANDARD DETAILS**	DATE: 12-21-2021
	PUMP STATION EXAMPLE ACCESS DRIVEWAY AND TURN AROUND AREA	FULTON COUNTY PUBLIC WORKS 141 PRYOR ST. ATLANTA, GA. 30303 404-612-7400 FAX: 404-224-0498
	NOT TO SCALE	DETAIL NO. P-012

Revised: 12-28-2022 (1)

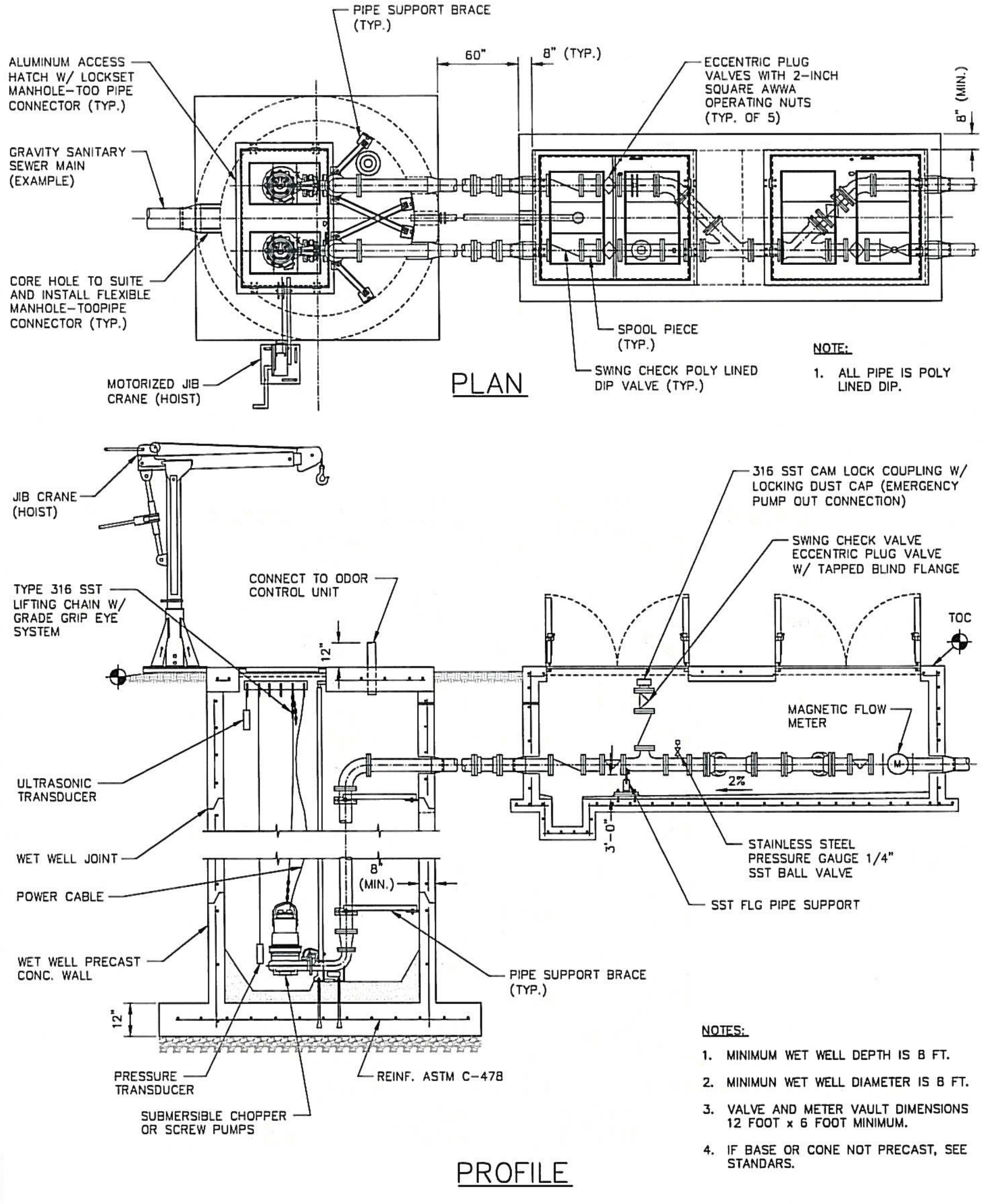


NOTES:

1. CONTRACTOR SHALL SUBMIT COPY OF PLAN AND PROFILES OF ACCESS ROAD FROM PUMP STATION TO EXISTING ROAD OR STREET. SLOPE OF ACCESS ROAD SHALL COMPLY WITH FULTON COUNTY REGULATIONS.
2. ACCESS DRIVEWAY SHALL INCLUDE EXPANSION JOINTS AS NEEDED.
3. ACCESS DRIVEWAY REINFORCEMENT SHALL BE DESIGNED TO WITHSTAND 80,000 LB LOAD.

FULTON COUNTY	FULTON COUNTY STANDARD DETAILS	DATE: 12-21-2021
	PUMP STATION TYPICAL DRIVE CROSS SECTION	FULTON COUNTY PUBLIC WORKS 141 PRYOR ST. ATLANTA, GA. 30303 404-612-7400 FAX: 404-224-0498
	NOT TO SCALE	DETAIL NO. P-013

Revised: 12-30-2022 (2)



FULTON COUNTY

FULTON COUNTY STANDARD DETAILS

PUMP STATION
TYPICAL DETAIL
MAXIMUM 50 HP PUMPS AND 1 MGD FLOW

NOT TO SCALE

DATE: 12-21-2021

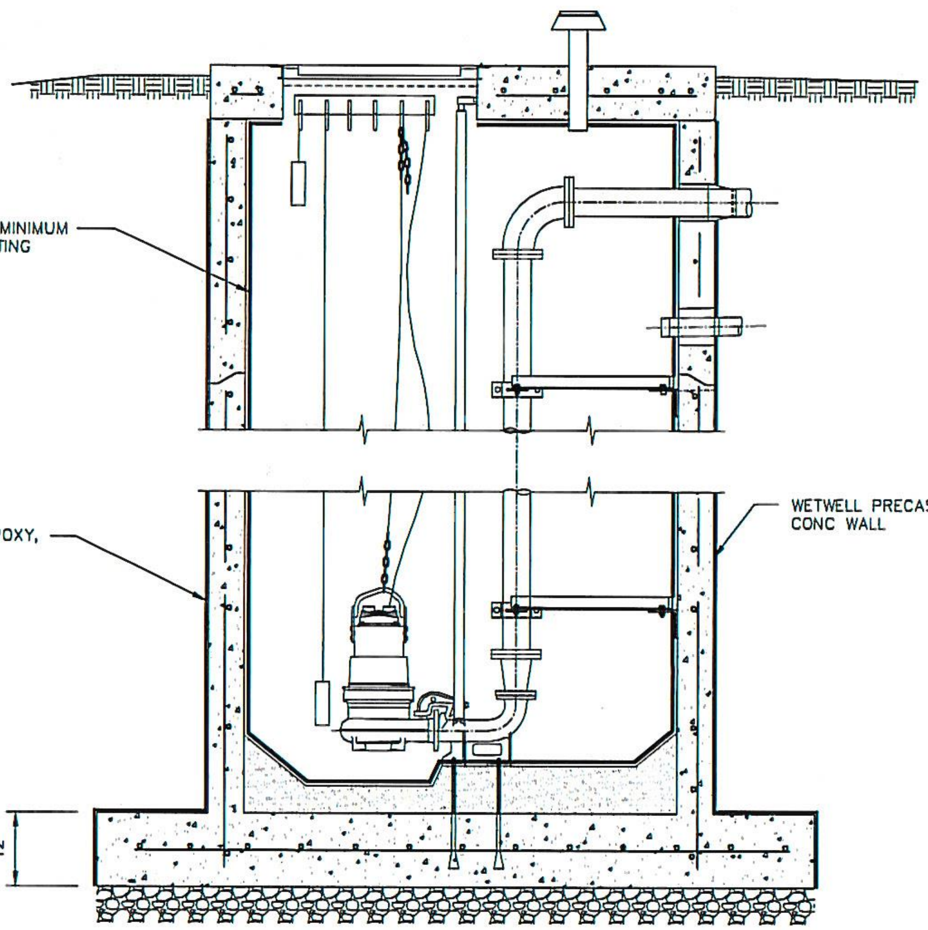
FULTON COUNTY PUBLIC WORKS
141 PRYOR ST.
ATLANTA, GA. 30303
404-612-7400
FAX: 404-224-0498

DETAIL NO. P-014

Revised: 12-28-2022 (1)

NOTES:

1. INTERIOR AND EXTERIOR OF WETWELL VALVE VAULT SHALL HAVE SPRAY EPOXY APPLIED PER THE MANUFACTURER'S RECOMMENDATION.
2. ACCEPTABLE PRODUCTS SHALL BE CPP SPRAYLINER BY EPOXY TEC OR APPROVED EQUAL.
3. REFER TO SECTION 33 01 32 OF FULTON COUNTY SEWER STANDARD SPECIFICATIONS.



FULTON COUNTY

FULTON COUNTY STANDARD DETAILS

PUMP STATION COATING DETAIL

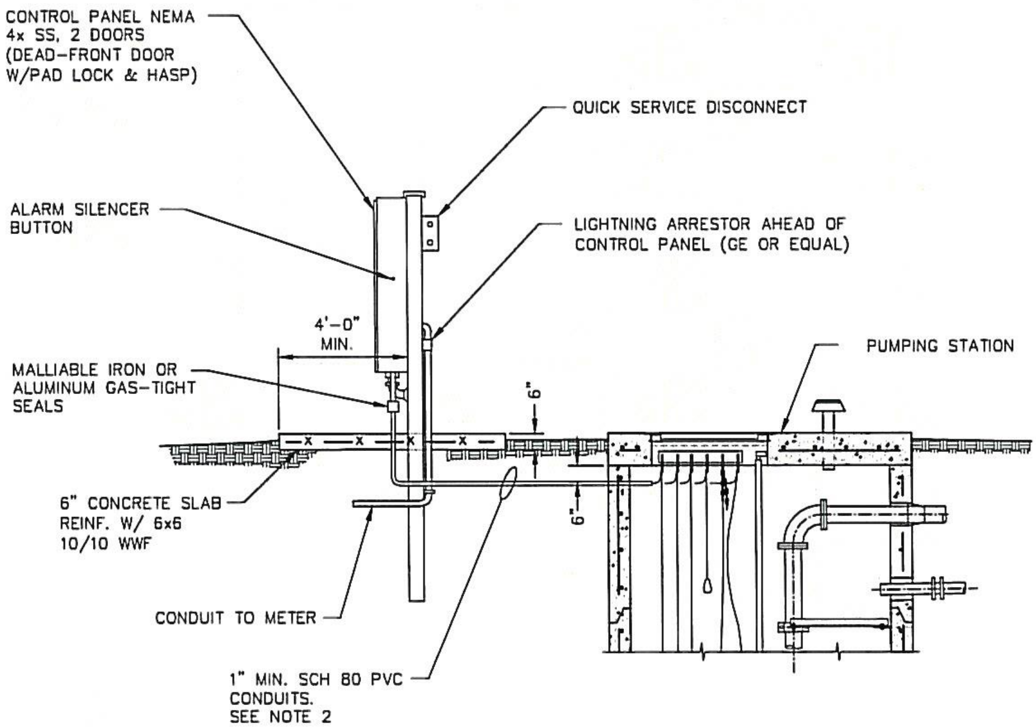
NOT TO SCALE

DATE: 12-21-2021

FULTON COUNTY PUBLIC WORKS
141 PRYOR ST.
ATLANTA, GA. 30303
404-612-7400
FAX: 404-224-0498

DETAIL NO. P-015

Revised: 12-28-2022 (1)



NOTES:

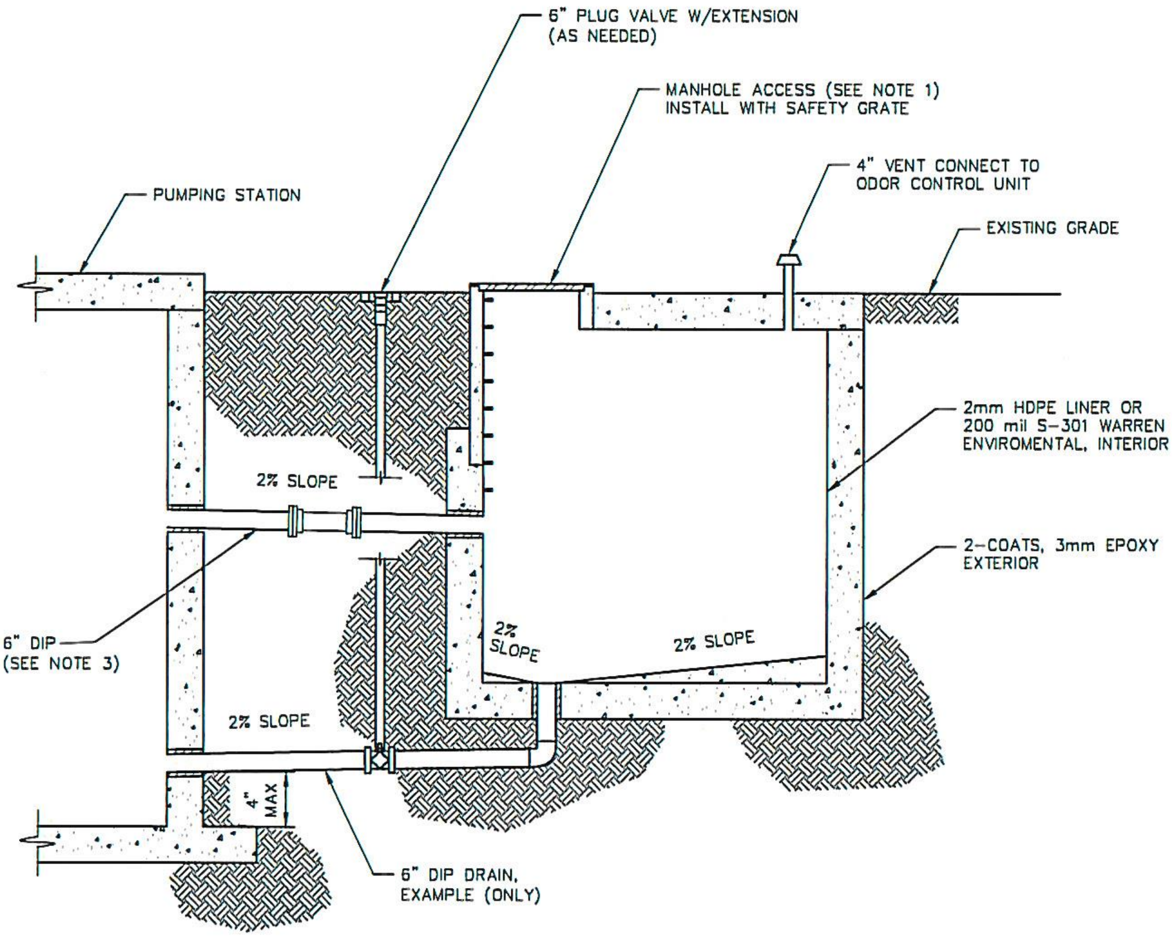
1. AWNING NOT SHOWN FOR CLARITY. SEE NOTE 4 ON P-001 FOR AWNING REQUIREMENTS.

2. CONDUIT SIZES SHALL BE INCREASED AS NECESSARY TO ACCOMMODATE POWER AND CONTROL CABLES.

SECTION

FULTON COUNTY	**FULTON COUNTY STANDARD DETAILS**	DATE: 12-21-2021
	PUMP STATION CABLE DETAIL	FULTON COUNTY PUBLIC WORKS 141 PRYOR ST. ATLANTA, GA. 30303 404-612-7400 FAX: 404-224-0498
	NOT TO SCALE	DETAIL NO. P-016

Revised: 12-28-2022 (1)

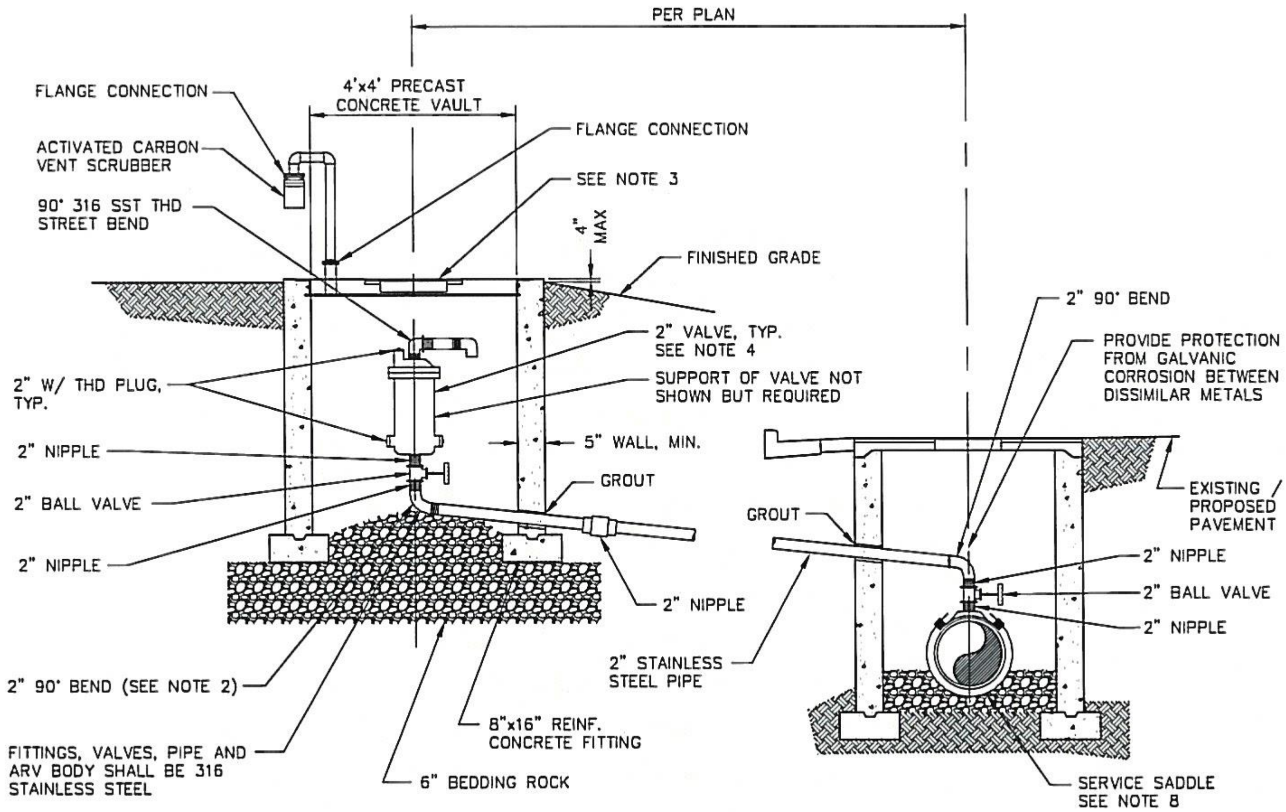


NOTES:

1. USE OF OVERFLOW TANK IS NOT ALLOWED EXCEPT WHEN SPECIFICALLY DIRECTED BY FCDPW.
2. FOLLOW REQUIREMENTS FOUND IN PART III GRAVITY STANDARDS FOR STEPS AND MANHOLE COVER REQUIREMENTS.
3. PIPES ARE ROTATED TO BE SHOWN IN THE SAME VIEW.
4. OVERFLOW PIPE INVERT SHALL BE EQUAL TO HIGH LEVEL ALARM.
5. VOLUME OF OVERFLOW SHALL BE EQUAL TO THREE HOURS OF STORAGE AT PEAK FLOW, MINIMUM 32,000 GALLONS.
6. OVERFLOW TANK MUST BE ENTIRELY WITHIN 120 FT BY 120 FT BUFFER AREA. MANHOLE ACCESS AND VENT TO BE LOCATED WITHIN FENCE AREA.
7. OVERFLOW VAULT TOP SLAB REINFORCEMENT SHALL BE DESIGNED TO WITHSTAND 80,000 LB LOAD.
8. ODOR CONTROL UNIT TO BE INCREASED FOR OVERFLOW TANK.
9. INSTALLATION OF OVERFLOW TANK DOES NOT REMOVE REQUIREMENT FOR BACKUP POWER GENERATOR.

FULTON COUNTY	FULTON COUNTY STANDARD DETAILS	DATE: 12-21-2021
	PUMP STATION EXAMPLE OVERFLOW TANK	FULTON COUNTY PUBLIC WORKS 141 PRYOR ST. ATLANTA, GA. 30303 404-612-7400 FAX: 404-224-0498
	NOT TO SCALE	DETAIL NO. P-017

Revised: 12-28-2022 (1)



NOTES:

1. ABOVE DETAIL IS BASED ON A 2" WASTEWATER AIR/VACUUM RELEASE VALVE. VALVE SIZES SHALL BE DETERMINED BY THE DEVELOPER'S ENGINEER AND APPROVED BY FULTON COUNTY PUBLIC WORKS PRIOR TO INSTALLATION. SPECIFIC COMPONENTS WILL BE DIFFERENT BASED ON DIFFERENT SIZES.
2. THE MINIMUM DIMENSION FROM INVERT TO FINISHED GRADE SHALL BE 4.0 FEET.
3. FRAME AND COVER SHALL BE EQUIVALENT TO U.S. FOUNDARY USF 170-E-ORS.
4. VALVE SHALL BE VENT TECH OR VENT-O-MAT OR EQUAL. SIZE SHALL BE BASED ON FORCE MAIN SIZE.
5. THE WASTEWATER AIR/VACUUM RELEASE VALVE VAULT IS NOT DETAILED FOR VEHICULAR TRAFFIC LOADS AND IS NOT INTENDED FOR PLACEMENT WITHIN THE TRAVELED WAY.
6. VAULT VENT SHALL BE PROVIDED WITH ACTIVATED CARBON ODOR CONTROL CANISTER.
7. AIR-VACUUM VALVE SHALL BE PROVIDED WITH SUPPORTS.
8. PROVIDE SERVICE SADDLE WITH NTP THREADED OUTLETS:
   - DESIGNED FOR USE WITH DIP, PVC AND HDPE PIPES WITH A WORKING PRESSURE OF 300 PSI.
   - BODIES: DUCTILE IRON PER ASTM A536.
   - STRAPS: TYPE 304 STAINLESS STEEL. DOUBLE STRAP 1.50" WIDE.
   - NUTS: TYPE 304 STAINLESS STEEL FLUOROPOLYMER COATED.
   - WASHERS: TYPE 304 STAINLESS STEEL
   - STUDS: TYPE 304 STAINLESS STEEL
   - GASKET: NITRILE (BUNA N) NSF 61® COMPOUNDED TO RESIST OIL, ACIDS, ALKALIES, MOST (ALIPHATIC) HYDROCARBON FLUIDS, WATER AND OTHER CHEMICALS.
   - FINISH: FLEXI-COAT® FUSION-BONDED EPOXY FINISH PER AWWA C213.
   - AS MANUFACTURED BY SMITH BLAIR OR FCPW APPROVED EQUAL.

FULTON COUNTY	FULTON COUNTY STANDARD DETAILS	DATE: 12-21-2021
	PUMP STATION COMBINATION AIR-VACUUM VALVE INSTALLATION DETAIL	FULTON COUNTY PUBLIC WORKS 141 PRYOR ST. ATLANTA, GA. 30303 404-612-7400 FAX: 404-224-0498
	NOT TO SCALE	DETAIL NO. P-018

Revised: 12-28-2022 (1)

LEGEND

AH – ALARM HORN

AIT – ANALYSIS INDICATING TRANSMITTER

AL – ALARM LIGHT

ASB – ALARM SILENCE BUTTON

ATS – AUTOMATIC TRANSFER SWITCH

CCB – CONTROL CIRCUIT BREAKER

DRB – DUPLEX RECEPTACLE BREAKER

ECB – EMERGENCY CIRCUIT BREAKER

ETM – ELAPSE TIME METER

F – FUSE

FIT – FLOW INDICATING TRANSMITTER

FL – FLASHER

GFDR – GROUND FAULT DUPLEX RECEPTACLE

HOA – HANDS–OFF–AUTO SELECTOR SWITCH

LIT – LEVEL INDICATING TRANSMITTER

LSH – LEVEL SWITCH HIGH

MB – MOTOR BREAKER

MCB – MAIN CIRCUIT BREAKER

MSH – MOISTER SENSOR HIGH

MS – MOTOR STARTER

PL – PILOT LIGHT

PLC – PROGRAMABLE LOGIC CONTROLLER

PM – PHASE MONITOR

RCB – RTU CIRCUIT BREAKER

RL – RUNNING LIGHT

RTU – REMOTE TRANSMITTING UNIT

TB – TERMINAL BLOCK

TS – TEST SWITCH

TSH – TEMPERATURE SWITCH HIGH

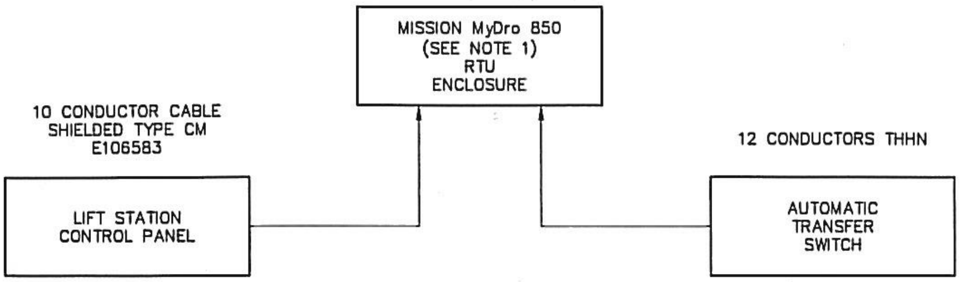
TVSS – TRANSIENT VOLTAGE SURGE SUPPRESSER

XFMR – TRANSFORMER

FULTON COUNTY	FULTON COUNTY STANDARD DETAILS	DATE: 12–21–2021
	PUMP STATION ELECTRICAL LEGEND	FULTON COUNTY PUBLIC WORKS 141 PRYOR ST. ATLANTA, GA. 30303 404–612–7400 FAX: 404–224–0498
	NOT TO SCALE	DETAIL NO. P–019

Revised: 12–28–2022 (1)

PUMPING STATION RTU CONNECTIONS



RTU ENCLOSURE MIXED I/O MODULE

FROM RTU ENCLOSURE DOOR LIMIT

1	SPARE
2	SPARE
3	SPARE
4	SPARE
5	SPARE
6	SITE SECURITY
7	SPARE
8	GEN INTRUSION

#14 AWG FROM GEN TRANS

9	GENERATOR RUNNING
10	PUMP 1 FAILURE
11	PUMP 2 FAILURE
12	HIGH WET WELL
13	CONTROL VOLTAGE FAILURE/STATION FLOODED
14	COMMON
15	GEN FAULT
16	GEN WARNING

17	LOW FUEL LEVEL
18	LOW GAS PRESSURE
19	OVER RUN CONDITION
20	HIGH ENGINE TEMP
21	LOW ENGINE TEMP
22	LOW COOLANT
23	LOW OIL PRESSURE
24	FUEL TANK RUPTURE BASIN ALARM

25	NOT IN AUTO
26	SOURCE 1 AVAILABLE
27	SOURCE 1 CONNECTED
28	SOURCE 2 AVAILABLE
29	SOURCE 2 CONNECTED
30	TRANSFER SWITCH NORMAL POSITION
31	TRANSFER SWITCH EMERGENCY POSITION
32	AC LINE FAILURE

33	HIGH BATTERY VOLTAGE
34	LOW BATTERY VOLTAGE
35	SPARE
36	LIT-1
37	LIT-2
38	FIT-1
39	XIT-1
40	AIT-1

NOTE:

1. OR CURRENT MODEL AS DIRECTED BY FCPW.

FULTON COUNTY

FULTON COUNTY STANDARD DETAILS

PUMP STATION RTU CONNECTIONS

NOT TO SCALE

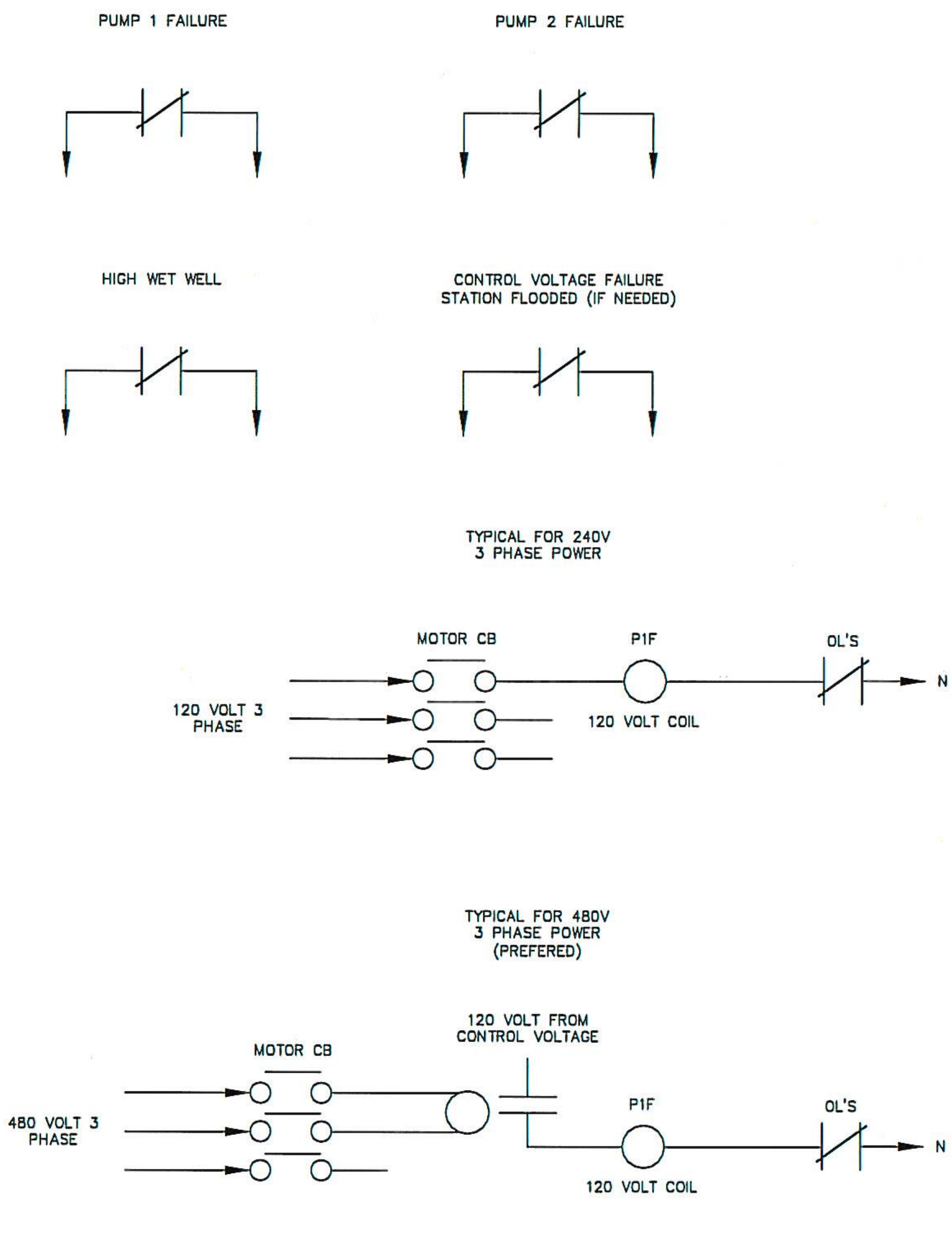
DATE: 12-21-2021

FULTON COUNTY PUBLIC WORKS
141 PRYOR ST.
ATLANTA, GA. 30303
404-612-7400
FAX: 404-224-0498

DETAIL NO. P-020

Revised: 01-03-2023 (3)

BASIC LIFT STATION CONTROL PANEL – RTU ALARM INPUTS



RELAY TYPE:
480 VOLT AC COIL, PORTER & BRUMFIELD PRD-11AYO-480 OF EQUAL.

FULTON COUNTY

FULTON COUNTY STANDARD DETAILS

PUMP STATION
BASIC CONTROL PANEL DETAIL
RTU ALARM INPUTS

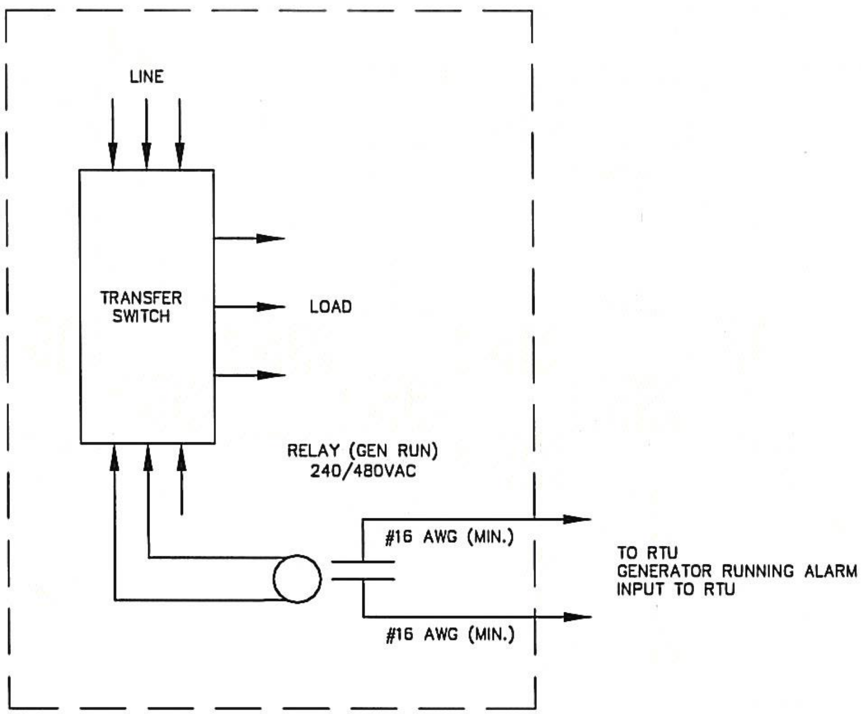
NOT TO SCALE

DATE: 12-21-2021

FULTON COUNTY PUBLIC WORKS
141 PRYOR ST.
ATLANTA, GA. 30303
404-612-7400
FAX: 404-224-0498

DETAIL NO. P-021

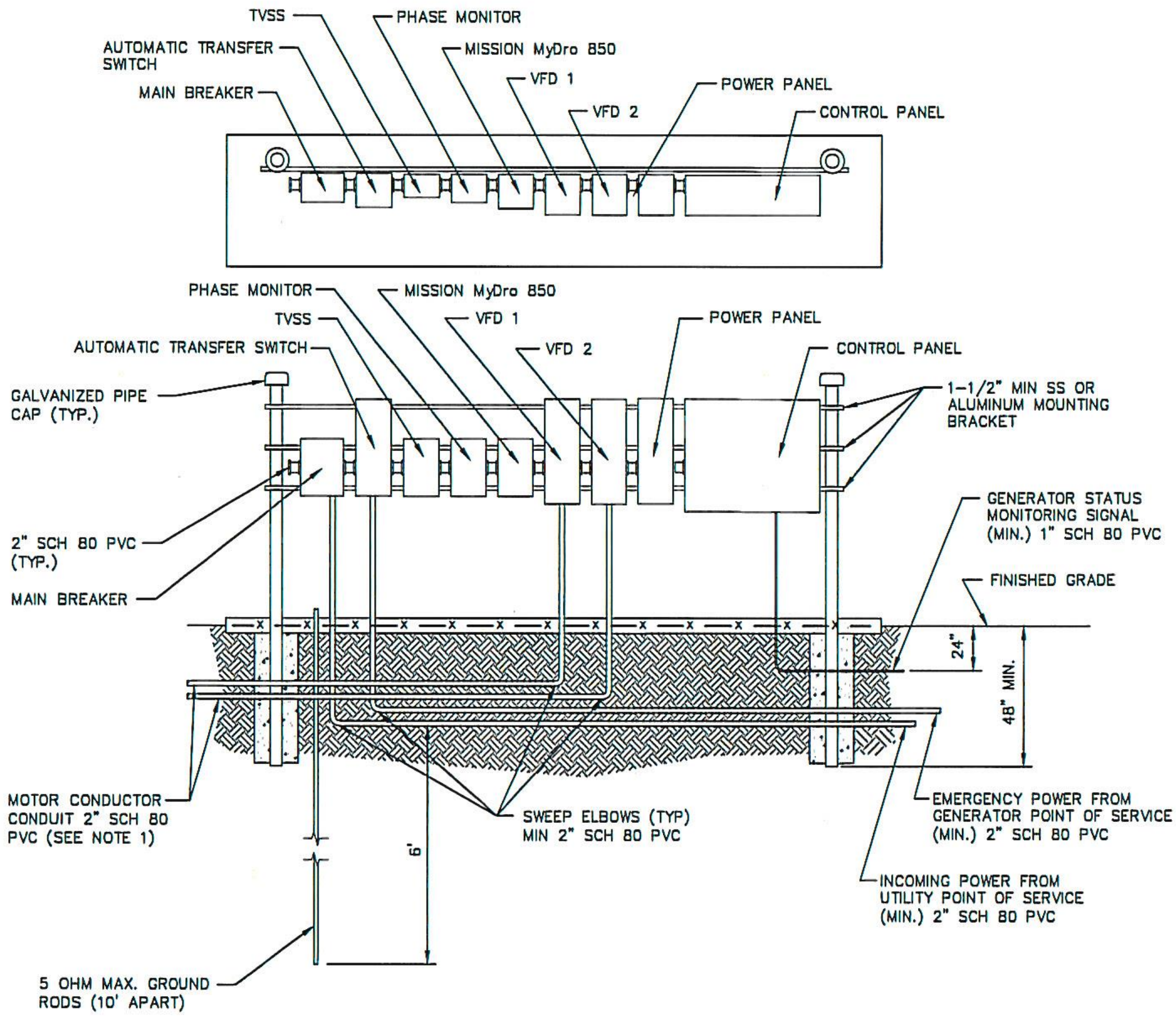
Revised: 12-28-2022 (1)



RELAY TYPES:
240VAC COIL, 8 PIN CUBE TYPE; 480VAC COIL PORTER & BRUMFIELD PRD-11AYO-480 OR EQUAL.

FULTON COUNTY	FULTON COUNTY STANDARD DETAILS	DATE: 12-21-2021
	PUMP STATION GENERATOR TRANSFER SWITCH GENERATOR RUN ALARM	FULTON COUNTY PUBLIC WORKS 141 PRYOR ST. ATLANTA, GA. 30303 404-612-7400 FAX: 404-224-0498
	NOT TO SCALE	DETAIL NO. P-022

Revised: 12-28-2022 (1)

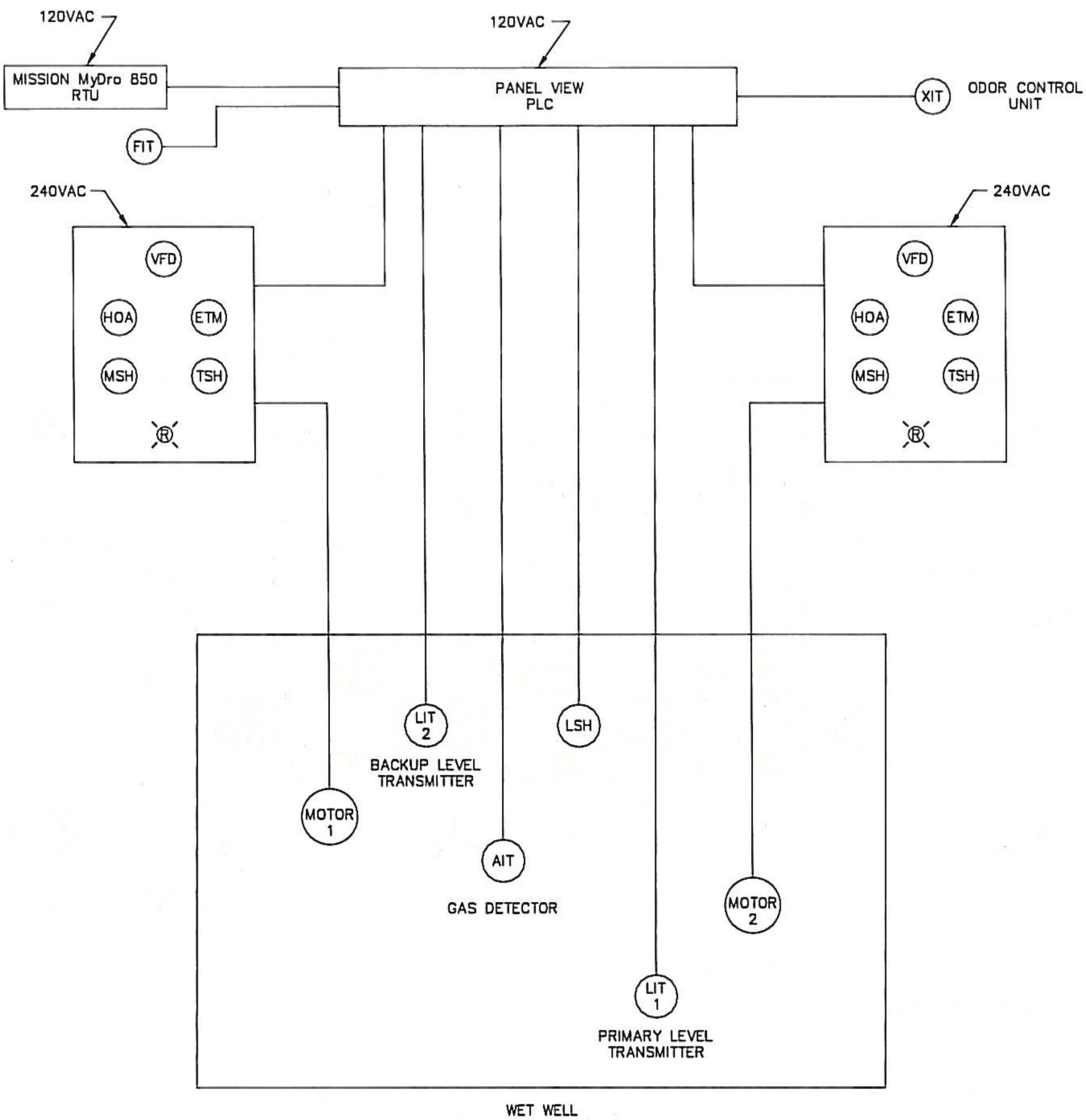


PANEL INSTALLATION NOTES:

1. PUMP MOTOR CONDUIT SHALL BE SIZED TO BE ONLY 40% FILLED. MINIMUM CONDUIT SIZE TO BE 2" SCH 80 PVC.
2. POWER SUPPLY SHALL BE UNDERGROUND ON THE LIFT STATION SITE AND SHALL BE 3-PHASE, FROM A 3-PHASE SOURCE ONLY.
3. AN ELECTRICAL GROUNDING SYSTEM SHALL BE INSTALLED AS PER THE NATIONAL ELECTRICAL CODE, LOCAL CODES AND ORDINANCES. AN UNDERGROUND PERIMETER CABLE GROUNDING SYSTEM SHALL BE INSTALLED WITH CONNECTIONS TO AT LEAST WET WELL COVER, VALVE VAULT COVER, CONTROL PANELS, GENERATOR, UTILITY COMPANY TRANSFORMER, MANUAL DISCONNECT SWITCH AND METAL FENCE.
4. ALL MOUNTING HARDWARE & BRACKETS SHALL BE 316 STAINLESS STEEL.
5. ON A 4-WIRE, DELTA SYSTEM, THE HIGH-LEG SHALL BE IDENTIFIED WITH ORANGE COLOR TAPE AT ALL CONNECTION POINTS AND SHALL BE LOCATED ON THE "B" PHASE AT THE LINE SIDE OF THE MAIN DISCONNECT.
6. PANELS AND ELECRICAL CXABINETS SHALL BE COVERED WITH A 4 FEET WIDE BY 8 FEET HIGH AWNING (NOT SHOWN).

FULTON COUNTY	FULTON COUNTY STANDARD DETAILS	DATE: 12-21-2021
	PUMP STATION TYPICAL POWER AND CONTROL PANEL RACK (240 VOLT)	FULTON COUNTY PUBLIC WORKS 141 PRYOR ST. ATLANTA, GA. 30303 404-612-7400 FAX: 404-224-0498
	NOT TO SCALE	DETAIL NO. P-023

Revised: 12-28-2022 (1)



FULTON COUNTY

FULTON COUNTY STANDARD DETAILS

PUMP STATION
EXAMPLE DUPLEX PUMP CONTROL
BLOCK DIAGRAM (240V)

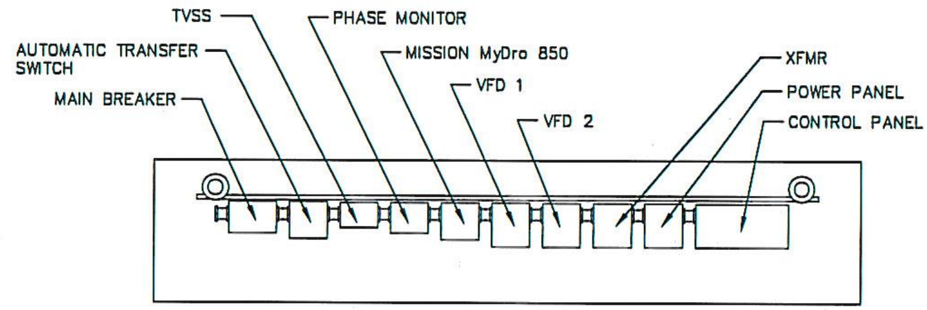
NOT TO SCALE

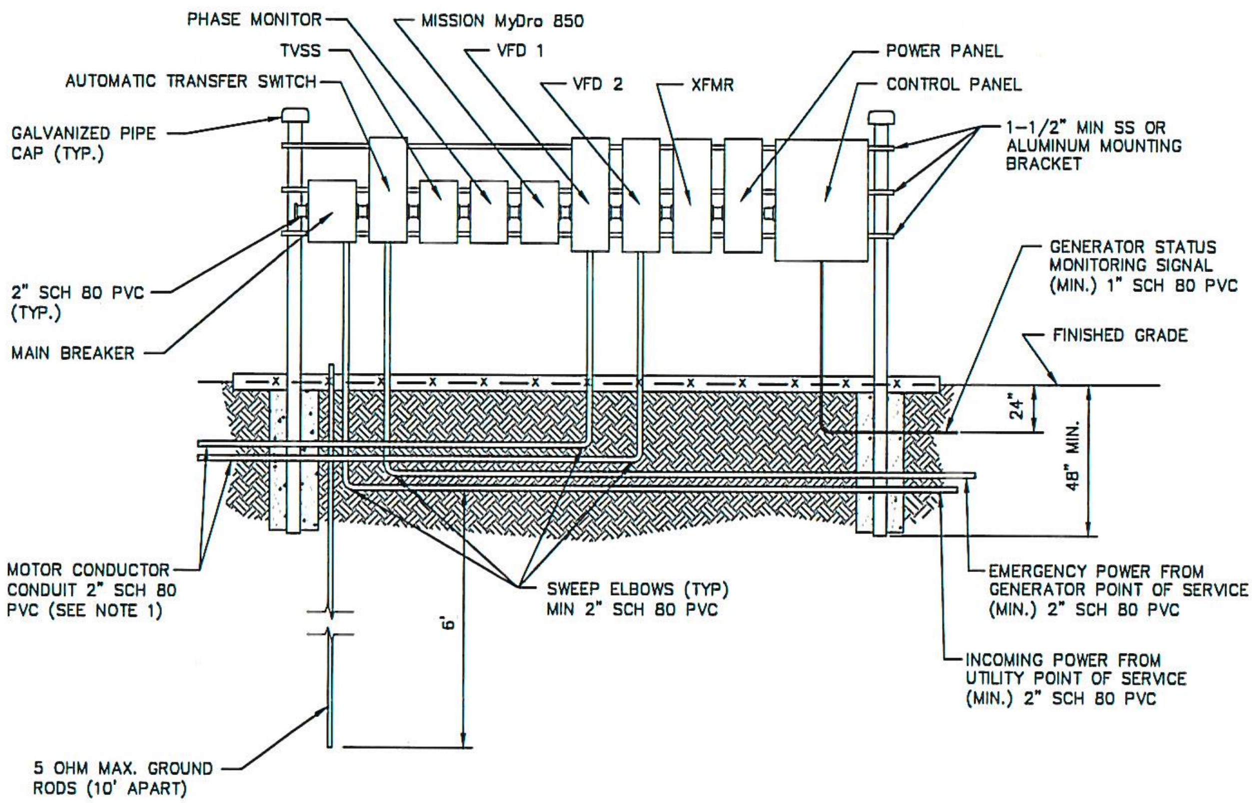
DATE: 12-21-2021

FULTON COUNTY PUBLIC WORKS
141 PRYOR ST.
ATLANTA, GA. 30303
404-612-7400
FAX: 404-224-0498

DETAIL NO. P-024

Revised: 12-28-2022 (1)



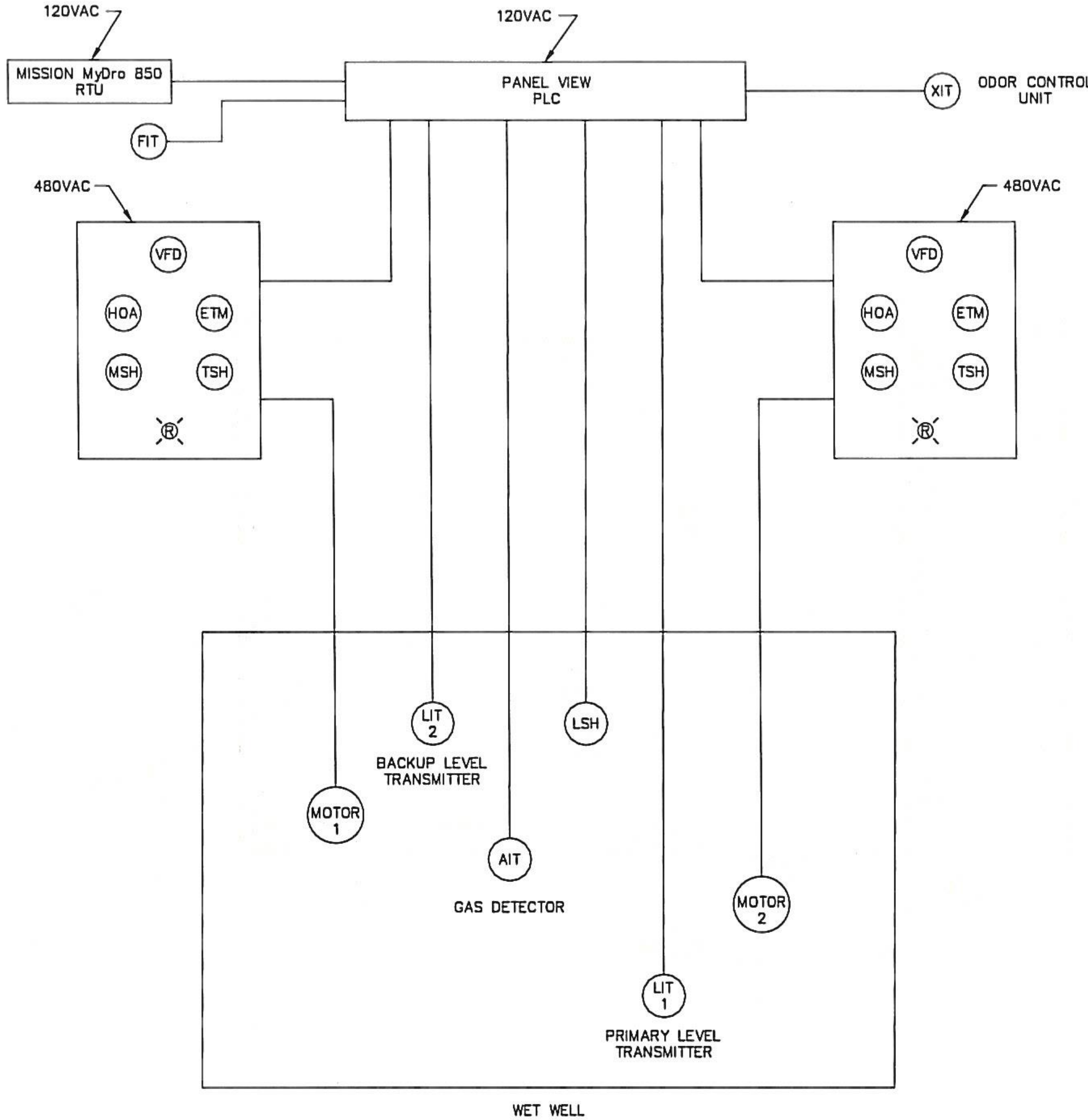


PANEL INSTALLATION NOTES:

1. PUMP MOTOR CONDUIT SHALL BE SIZED TO BE ONLY 40% FILLED. MINIMUM CONDUIT SIZE TO BE 2" SCH 80 PVC.
2. POWER SUPPLY SHALL BE UNDERGROUND ON THE LIFT STATION SITE AND SHALL BE 3-PHASE, FROM A 3-PHASE SOURCE ONLY.
3. AN ELECTRICAL GROUNDING SYSTEM SHALL BE INSTALLED AS PER THE NATIONAL ELECTRICAL CODE, LOCAL CODES AND ORDINANCES. AN UNDERGROUND PERIMETER CABLE GROUNDING SYSTEM SHALL BE INSTALLED WITH CONNECTIONS TO AT LEAST WET WELL COVER, VALVE VAULT COVER, CONTROL PANELS, GENERATOR, UTILITY COMPANY TRANSFORMER, MANUAL DISCONNECT SWITCH AND METAL FENCE.
4. ALL MOUNTING HARDWARE & BRACKETS SHALL BE 316 STAINLESS STEEL.
5. ON A 4-WIRE, DELTA SYSTEM, THE HIGH-LEG SHALL BE IDENTIFIED WITH ORANGE COLOR TAPE AT ALL CONNECTION POINTS AND SHALL BE LOCATED ON THE "B" PHASE AT THE LINE SIDE OF THE MAIN DISCONNECT.
6. PANELS AND ELECTRICAL CABINETS SHALL BE COVERED WITH A 4 FEET WIDE BY 8 FEET HIGH AWNING (NOT SHOWN).

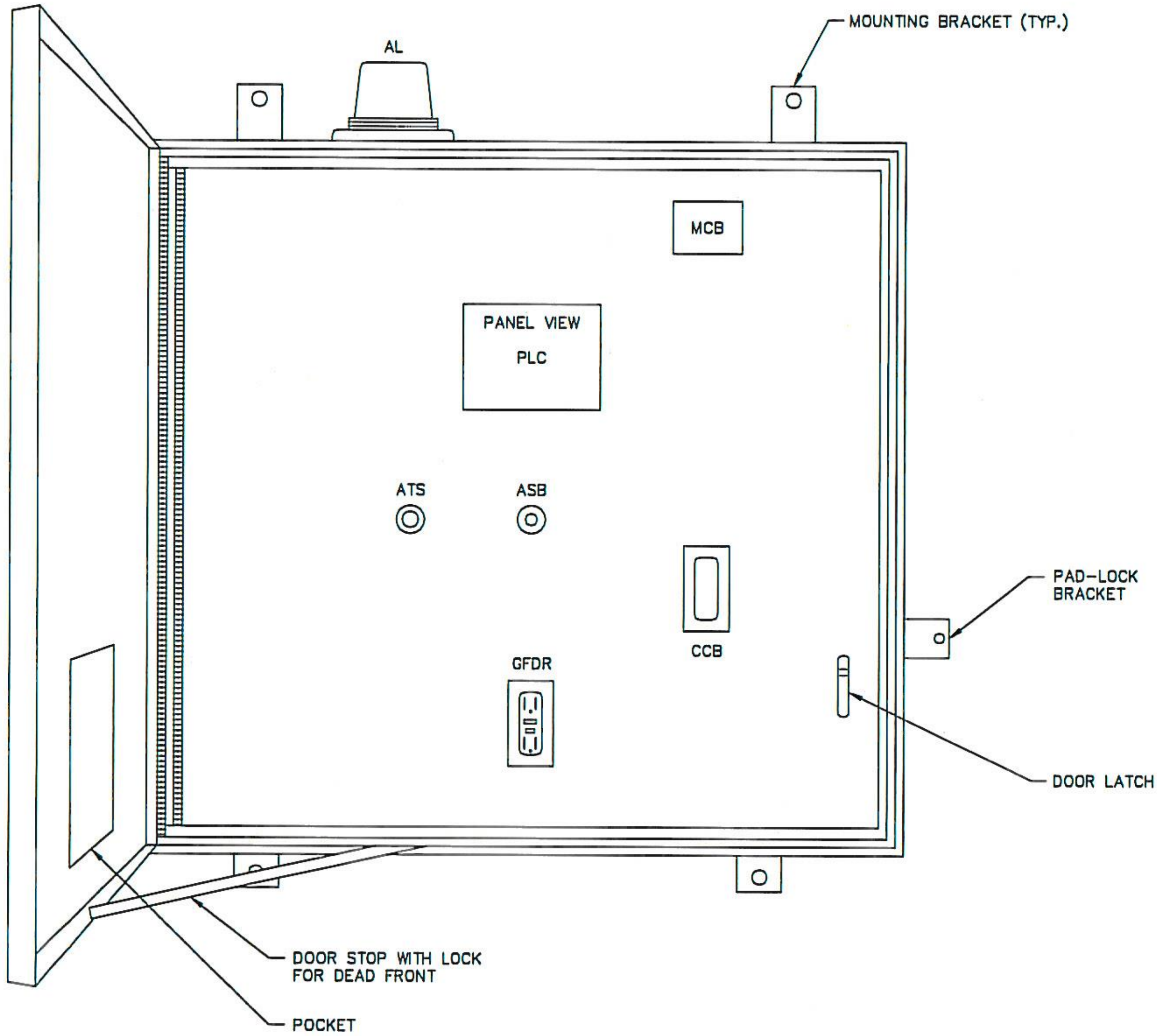
FULTON COUNTY	FULTON COUNTY STANDARD DETAILS	DATE: 12-21-2021
	PUMP STATION TYPICAL POWER AND CONTROL PANEL RACK (480 VOLT)	FULTON COUNTY PUBLIC WORKS 141 PRYOR ST. ATLANTA, GA. 30303 404-612-7400 FAX: 404-224-0498
	NOT TO SCALE	DETAIL NO. P-025

Revised: 12-28-2022 (1)



FULTON COUNTY	FULTON COUNTY STANDARD DETAILS	DATE: 12-21-2021
	PUMP STATION EXAMPLE DUPLEX PUMP CONTROL BLOCK DIAGRAM (480V)	FULTON COUNTY PUBLIC WORKS 141 PRYOR ST. ATLANTA, GA. 30303 404-612-7400 FAX: 404-224-0498
	NOT TO SCALE	DETAIL NO. P-026

Revised: 12-28-2022 (1)

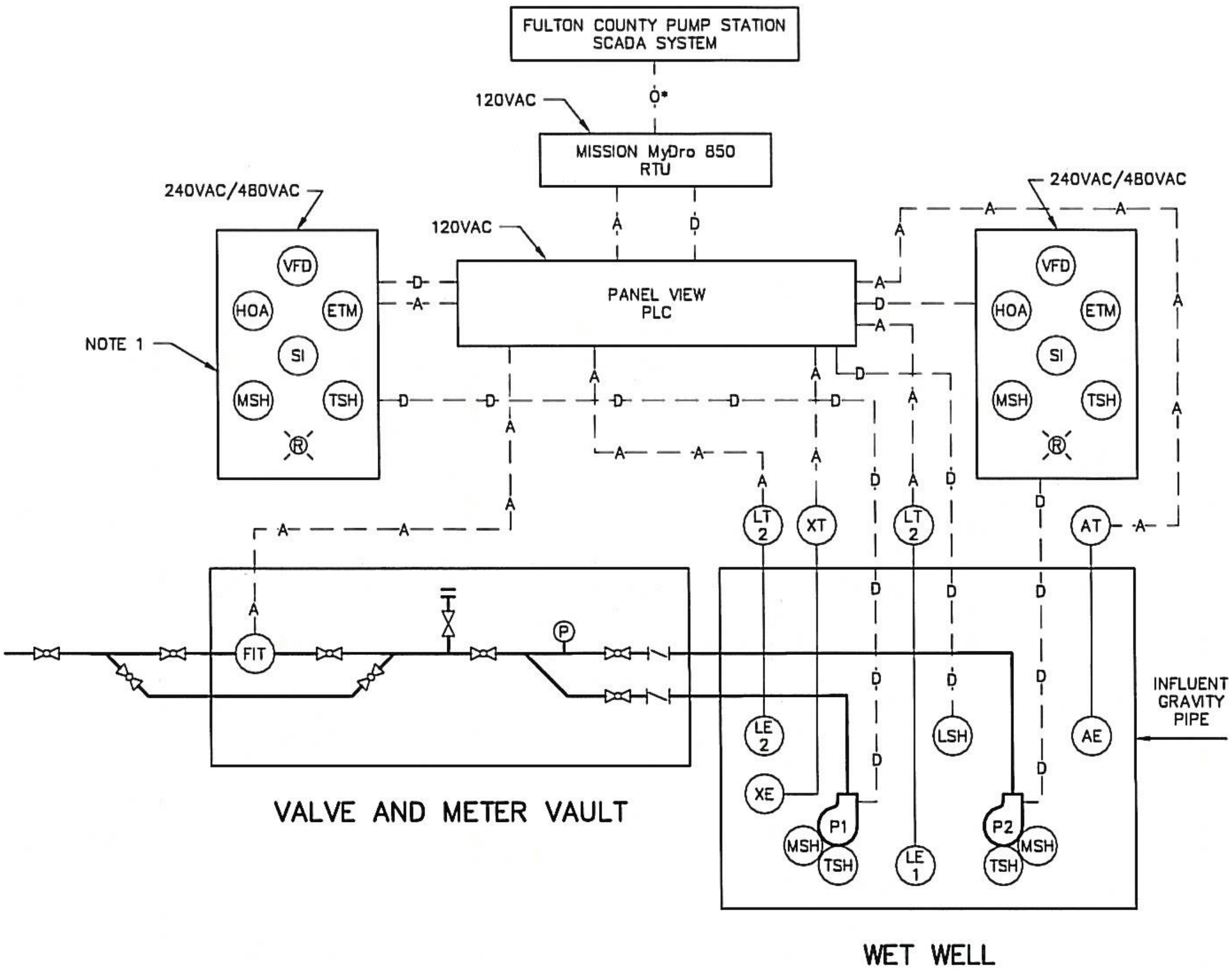


NOTES:

1. DEADFRONT LAYOUT NEMA TYPE 3R SS ENCLOSURE W/CONTINUOUS HINGE. ALL HARDWARE TYPE 316 SS TYPICAL, ACTUAL MAY VARY WITH HORSEPOWER AND NUMBER OF PUMPS.
2. ALL CONTROL WIRE TO BE #16 AWG, MINIMUM.
3. CONTROL PANEL SHALL BE UL LISTED AND LABELED.
4. PANEL VIEW PLC (HMI) SHALL BE 10-INCH MINIMUM.
5. EXTERIOR OF PANEL SHALL BE POWDER COATED WHITE.

FULTON COUNTY	FULTON COUNTY STANDARD DETAILS	DATE: 12-21-2021
	PUMP STATION EXAMPLE DUPLEX CONTROL PANEL ENCLOSURE DEAD FRONT LAYOUT	FULTON COUNTY PUBLIC WORKS 141 PRYOR ST. ATLANTA, GA. 30303 404-612-7400 FAX: 404-224-0498
	NOT TO SCALE	DETAIL NO. P-027

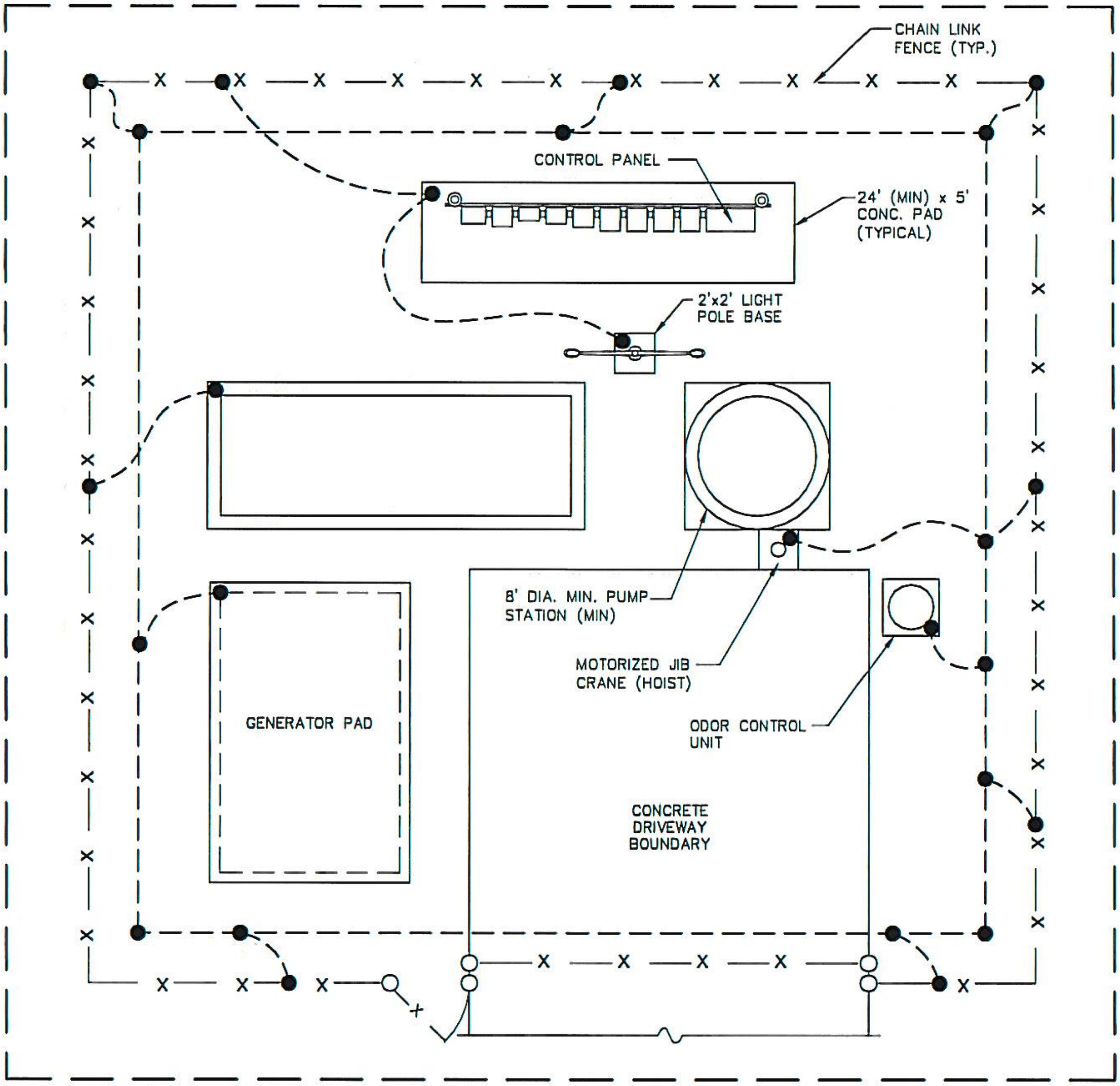
Revised: 12-30-2022 (2)



*DATA

FULTON COUNTY	FULTON COUNTY STANDARD DETAILS	DATE: 12-21-2021
	PUMP STATION EXAMPLE PROCESS AND INSTRUMENTATION DIAGRAM	FULTON COUNTY PUBLIC WORKS 141 PRYOR ST. ATLANTA, GA. 30303 404-612-7400 FAX: 404-224-0498
	NOT TO SCALE	DETAIL NO. P-028

Revised: 01-03-2023 (3)



NOTES:

GROUNDING ELECTRODE SYSTEM

1. A GROUNDING SYSTEM SHALL BE INSTALLED AS OER THE NATIONAL ELECTRICAL CODE, LOCAL CODES AND ORDINANCES.
2. AN UNDERGROUND PERIMETER CABLE GROUNDING SYSTEM SHALL BE INSTALLED WITH CONNECTIONS TO AT EAST THE FOLLOWING EQUIPMENT.
   a. WET WALL COVER.
   b. VAULT COVER.
   c. CONTROL PANEL MOUNTING RACK.
   d. MAIN DISCONNECT SWITCH.
   e. PUMP STATION FENCE.
3. BARE COPPER WIRE (#4) IS TO BE CONNECTED TO THE WET WELL COVER AND THE VALVE AND METER VAULT COVER BY WAY OF AN APPROVED MECHANICAL CONNECTION.
4. WIRE (#4) SHALL ALSO BE POURED INTO TOP SLAB OF WET WELL AND THE VALVE AND METER VAULT AT THE FOUNDRY WITH A TWELVE (12) INCH STUB-OUT FOR FIELD CONNECTION.
5. UNDER NO CIRCUMSTANCES SHALL WIRE BE ALLOWED TO RUN ACROSS THE OUTSIDE TOP SLABS.

FULTON COUNTY	**FULTON COUNTY STANDARD DETAILS**	DATE: 12-21-2021
	PUMP STATION EXAMPLE SITE GROUNDING PLAN	FULTON COUNTY PUBLIC WORKS 141 PRYOR ST. ATLANTA, GA. 30303 404-612-7400 FAX: 404-224-0498
	NOT TO SCALE	DETAIL NO. P-029

Revised: 01-03-2023 (3)