CHAPTER VIII

SEWAGE PUMPING STATIONS

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ANNE ARUNDEL COUNTY DESIGN MANUAL

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SEWAGE PUMPING STATIONS

I. GENERAL

A. Introduction

This Chapter of the Manual outlines the design of sewage pumping stations to meet the service needs of users and the operational responsibilities of the Department. The sewage pumping station design standards include: criteria, guidelines, drawings and technical specifications. The Reference Drawings for Sewage Pumping Stations as referred to herein are available from the County as a separate publication Supplement to the Design Manual, Chapter II – Sewage Pumping Stations. The Reference Specifications are available from the County as a separate document, Supplement to the Design Manual, Chapter I – Reference Pumping Station Specifications. This Chapter includes the criteria and guidelines for designing sewage-pumping stations within the limits of applicability for these design standards.

The design standards generally apply to sewage pumping stations up to 3.0 million gallons per day (MGD) capacity. Sewage pumping stations of 3.0 MGD pumping capacity and below shall be designed as discussed in Section II. Paragraph G, later in this document. Design of larger sewage pumping stations with greater than 3.0 MGD capacity shall be considered on a case-by-case basis, with special requirements as determined by the Department of Public Works.

The design professional shall check with the Department to determine the applicability of these design standards to planned sewage pumping stations. It is the responsibility of the design professional to integrate all applicable criteria and guidelines for sewage pumping stations incorporated into the Anne Arundel County Sewerage System.

To the extent practical, sewage pumping station designs shall conform to the guidelines given herein. The guidelines shall be applied to design conditions fully. Significant deviations from the guidelines must be brought to the attention of the Department. All deviations should be justified to the Department, in writing, from an engineering evaluation standpoint and include consideration of life cycle costs, reliability, and ease of maintenance.

All standards and regulations shall conform to the latest publication.

B. Ordinances and Authority

The material presented in this Chapter is in accordance with the responsibility delegated by ordinance, resolution, an executive or administrative order to the various County agencies.

C. Abbreviations

Whenever in this chapter or other chapters, the following abbreviations are used, they will stand for:

COMAR	Code of Maryland
DHS	Department of Health
DPW	Department of Public Works
EPACT	The Energy Policy Act of 2005
GPM	Gallons per Minute
HIS	Hydraulic Institute Standards
HP	Horsepower
HVAC	Heating, Ventilation and Air Conditioning
IBC	International Building Code
I/I	Inflow/Infiltration
IEEE	Institute of Electrical and Electronic Engineers
KW	Kilowatt
LPI	Lightning Protection Institute
MCC	Motor Control Center
MDE	Maryland Department of the Environment
MGD	Million Gallons per Day
NEC	National Electric Code
NFPA	National Fire Protection Association
NIOSH	National Institute for Occupational Safety and Health
O&M	Operations & Maintenance
OPZ	Office of Planning and Zoning (Anne Arundel)
OSHA	Occupational Safety and Health Administration
PVC	Polyvinyl Chloride
SCADA	Supervisory Control and Data Acquisition
SRC	State Roads Commission
RTU	Remote Telemetry Unit
TVSS	Transient Voltage Surge Suppressors
UL	Underwriters' Laboratory

II. DESIGN CRITERIA

A. Applicable Regulations

Sewage pumping stations must satisfy the regulations of agencies having jurisdiction. Sewage pumping stations shall conform to the Design Guidelines for Wastewater Facilities, 2016 edition or latest addenda as published by the Maryland Department of the Environment (MDE). The design professional shall also ensure that the sewage pumping station conforms to Design Guidelines for Wastewater Pumping Stations - Protection of Shellfish Waters and Swimming Waters, effective June 1, 1996, and All Surface Waters, effective July 1, 2011, published by MDE. Anne Arundel County Office of Planning and Zoning (OPZ) land use regulations shall be considered in the selection and development of sewage pumping station sites. Buildings shall comply

with IBC requirements and permitting requirements of the Anne Arundel County Department of Inspections and Permits. Other regulations governing facilities and construction shall be adhered to, including regulations published by the Occupational Safety and Health Administration, the National Fire Protection Association (NFPA), National Electric Code, Anne Arundel County Plumbing Code, and others as applicable. The design shall also comply with the latest NFPA 820 Standard for Fire Protection in Wastewater Treatment and Collection Facilities.

B. Pre-Design Meeting

Prior to commencing any design work on a pumping station, a pre-design meeting shall be held with DPW. These meetings will discuss, at a minimum, the following design parameters pertinent to this Chapter, in addition to items, which pertain to any other Chapter, which will govern the design of the project:

- On-site or Off-site Odor Control Measures
- Approved Drainage Area Study
- Design Flow
- Emergency 2 Hour Storage
- Emergency Diesel Bypass Pumping System
- Type of Sewage Pumping Station
- Type of Station Control System
- Grinder
- Flowmeters
- Pump Types and Special Material Requirements
- Pressure Gauges
- Normal and Emergency Power Supply
- Security Systems and Safety
- Site Layout
- Vacuum Truck and Maintenance Access
- Remote Telemetry Unit/SCADA

C. Schematic Design Report

For the Design Professionals guidance, below are listed major elements constituting the Schematic Design Phase of a Sewer Pumping Station Design Project:

1. Schematic Design Phase

The Schematic Design Phase shall include the verification of the existing as-builts and O&M documentation or any preliminary reports supplied by the County, if applicable.

It shall include the description of design criteria to be utilized, preliminary flow computations of average daily and peak flows, design calculations, calculated system curves, surge protection analysis/recommendation, service area description, identification of right-of-way requirements, number of property owners involved,

listing of permit requirements, and cost estimate based on unit costs for major elements of work. In addition, the following design criteria shall be developed:

- Sewage Pumping Station Location
- Land Acquisition
- Site Development
- Structural Design
- Architectural Design
- Hydraulic Analysis
- Surge Analysis
- Emergency Storage
- Mechanical Design
- Electrical Design
- Instrumentation and Process Control
- HVAC
- Corrosion Control
- Odor Control
- Noise Control
- Maintenance Vehicles Access

All information and data developed during the Schematic Design Phase shall be presented to the DPW in the Schematic Design Report. The final Schematic Design report shall document equipment selections and recommendations.

D. Flow

Sewage pumping stations must satisfy the design flow rate. The design flow for the sewage pumping stations shall consider existing and projected peak flow rates and sewage composition.

1. Planning Period

Sewage pumping station discharge flow rates shall, at minimum, accommodate a 20-year planning horizon. In circumstances where the status of a planned pumping station is interim, the planning period for establishing flow rate may be shorter with the Department's approval. For all pumping stations, consideration shall be given to future upgrading flexibility necessary to accommodate flows beyond the normal planning horizon. This is especially important for larger (more than 500 GPM) sewage pumping stations.

2. Existing and Projected Flow rates

Sewage pumping stations shall be designed to pump the flow, as defined by MDE guidelines, for existing and future users in the drainage basin (contributing area) plus the I/I allowance. In developed areas, population shall be determined by house count and non-domestic user inventory with allowances made for remaining undeveloped tributary areas. Population densities and per capita flows shall be as

established by comparable flow records or in agreement with the Master Plan for Water Supply and Sewerage Systems (Water and Sewer Master Plan) or instruction of the Department. Institutional, commercial and industrial flows shall be determined by a study of the establishment. OPZ shall be consulted for future domestic and non-domestic land use and population densities. An analysis should be requested from OPZ to establish flows in existing service areas. Flow rate computations shall follow guidance given in the Water and Sewer Master Plan, Appendix A: Water and Sewerage System Design Criteria. If applicable, Guidance on Wastewater Flows for Use in Designing On-site Systems by MDE shall be incorporated in the design flow rate. Average flow shall be calculated using Appendix E from Chapter IX – Water Mains and Related Facilities.

3. Composition

Sewage composition can vary widely depending upon the proportion of design flow generated by non-domestic users. Non-domestic user sewage composition shall be investigated. In the absence of existing non-domestic user information for planning purposes, reference is made to the Pretreatment Ordinance. Adequate consideration and necessary provisions shall be taken to ensure that sewage pumping station equipment and materials are suitable for the anticipated composition of sewage. Consultation with the Department is required in the event that the sewage composition affects standard material and equipment requirements.

E. Hydraulics/Pumps

Sewage pumping stations must satisfy the hydraulic conditions of the system. A complete analysis of each sewage pumping station is required. A thorough investigation and analysis of the sewage pumping station force main system shall be conducted. It shall consider features of configuration, operation and potential impacts on existing force mains, gravity sewers and pumping stations when the new pumping station is added to the system. Sewage pumping stations shall be designed to operate at the appropriate discharge head and flow rate. For existing sewage pump stations the design engineer shall calculate the existing C factor of the force main.

1. Pump/System Curve

System curve characteristics shall be determined by the Hazen-Williams formula for piping head loss. The pump/system curve shall be shown on the drawings (See Reference Drawings for Sewage Pumping Stations). Pump/system curves shall be shown for both new and aged force main conditions, as well as for multiple pump operation in stations having three or more pumps. Hazen-Williams "C" factors used in evaluating pump and system curves shall be selected using good engineering judgement and in accordance with the standards of the Hydraulic Institute. As a guideline, "C" factors for the following types of pipe are listed in Table VIII-1 below:

TABLE VIII-1 HAZEN-WILLIAMS "C" FACTORS

Type of Pipe	Size	"C" Factor
Ductile*		
New	All	130
5 years old	All, up to 24"	120
	24" and over	115
10 years old	4"	105
	12"	110
	30" and over	85
40 years old	4"	65
	16"	80
Welded Steel	All	Same as for ductile/cast iron 5 years and older
Concrete*	Large sizes, good workmanship, steel forms	140
	Centrifugally spun	135
PVC++	All	150
HDPE	All	150

++ Use of PVC pipe is subject to approval by the DPW

2. Water Hammer

   The potential impact of water hammer shall be evaluated. If the combined effects of static head and water hammer do not exceed the weakest piping system component working pressure, no special provisions need to be included to control water hammer. Where the maximum water hammer pressure exceeds the weakest piping system component working pressure, strengthen those elements affected, reevaluate pipe size and velocities, or select an appropriate device to control water hammer. Wherever possible, spring type, oil-cushioned elbow hydraulic surge relief valves are the preferred choice by the Department. No pressure vessel/surge tank type devices will be acceptable. The decision to strengthen piping system components instead of utilizing a water hammer control device or different pipe size shall be based upon life cycle cost economic comparison.

   In the evaluation of water hammer conditions, it will be necessary to include the impacts of the appropriately provided air release and air vacuum valves along the force main as required in Design Manual Chapter VII – Sanitary Sewage.

3. System Hydraulics/Pump Selection

   Provide proper wet well design and suction line design per Hydraulic Institute Standards to avoid air entrainment, vortexing cavitation, and related vibration problems. The design professional shall perform a net positive suction head available (NPSHA) analysis and include this information in the pump specification. The NPSHA shall be calculated for the expected design flows and shall exceed the

pump manufacturer's requirements by an added margin of safety of not less than 3 feet.

Avoid applications where pumps must operate in an adverse area of their performance curve. Examples would be pumps operating at very low flows and high heads, near shutoff heads, of "runout" conditions. These conditions can result in excessive hydraulic loading or cavitation damage to impellers, casings and shafts, rapid bearing and mechanical seal wear, and high vibration.

F. Siting

Sewage pumping stations must satisfy the site characteristics. Sewage pumping station site selection is dependent on a number of factors. Topography, access, availability of power supply, floodplain, wetlands, land use, aesthetic concerns, overflow potential, and impact to the environment shall collectively be considered in the process of site selection.

1. Location

Sewage pumping stations shall be located as far away as possible from populated areas. Natural screening and remoteness of the site shall be primary elements of site selection wherever possible. Maintain a 50-foot minimum buffer distance from existing and proposed residential property lines to the sewage pumping station property lines, unless otherwise approved by the DPW.

2. Topography

Sewers tributary to sewage pumping stations commonly dominate site selection. Adjacent drainage areas potentially served by the sewage pumping station must also be considered. Sewage pumping station site selection shall also be compatible with suitable site access, and soil capability with respect to land grading in conjunction with site development. Retaining walls within 50 feet of the property line of the sewage pump station are only allowed with DPW approval.

3. Access

All sewage pumping stations shall be sited to permit adequate access to the necessary facilities, by all-weather surface roads capable of accommodating a sewage pump truck with the size dependent on the type of station, as determined by DPW. Tee driveway or Turnaround shall be provided on site to ease the access for large maintenance vehicles.

4. Floodplain and Storm Surge

Sewage pumping stations shall be sited to remain operational and permit access during a 100-year return frequency flood. The entire finish grade of the sewage pump station site shall be a minimum of two feet above the 100-year floodplain elevation.

5. Wetlands

   Avoid direct impacts wherever possible and minimize impacts to wetland buffer areas. Buffer areas include the first 100 feet beyond tidal wetlands, or 25 feet beyond non-tidal wetlands.

6. Land Use

   Sewage pumping station sites should be selected to occupy vacant land. In new subdivisions the sewage pumping station site shall occupy an area at least equivalent in size to the minimum allowable lot size. In existing subdivisions site size shall meet the minimum allowable lot size if possible. Pumping station sites shall be acquired "fee simple" deeded to the County. Pump station sites must conform to land use regulations such as building restriction lines and setbacks in relation to neighboring properties. Pump station siting shall follow the Critical Areas Requirements for those installations where bayfront or wetlands proximity necessitates and shall follow requirements to meet MDE shellfish requirements for emergency holding capacity. All sewage pumping stations shall require a minimum of 2-hour storage capacity of the average daily flow.

7. Aesthetics

   Natural screening and remoteness of the site should be a primary element of site selection wherever possible. Where pump stations are sited in proximity to developed areas, predominant wind direction for potential odor dispersion and building aspects such as generator exhaust and ventilation fan noises shall be considered. Similarly, building setbacks shall be considered to provide minimal impact to neighboring properties.

8. Overflow

   Sewage overflow at sewage pumping stations is not permitted. Sewage pumping station sites shall be selected to permit site development, which will preclude on-site overflows.

9. Ownership

   It is the County's intent not to allow pump stations to be designed and built for private ownership. In the rare and extenuating circumstances where private ownership must be considered, the pump station and all appurtenances shall be in strict compliance with the County Standards, unless approved by the DPW. Pump station sites shall be separately deeded lots to the DPW. All lots shall be large enough to allow for equipment and conform to County zoning requirements.

10. Soil Boring

    At least two test borings shall be taken at the wet well/dry well and control building locations to determine soil types, rock types, water table elevation, soil bearing

values, etc. The design professional shall determine if more than two test borings are required based on the subsurface conditions and size of proposed structure. Boring shall be taken to a depth of not less than fifteen (15) feet below the bottom of the proposed structure. Boring shall be taken deeper as necessary depending on soil conditions.

G. Selection of Sewage Pumping Station Type

The type of sewage pumping station required by the Department will be governed by station capacity in terms of flow rate and horsepower subject to the limitations set forth.

Reference Drawings for Pumping Stations are available as separate documents from the County DPW. These reference drawings provide the design professional with the minimum notes, details and drawing layouts which the DPW requires on design drawings for sewage pumping stations. The reference drawings are not part of the Standard Details and are to be incorporated into the Contract Drawings as needed for individual projects. The design details were prepared for 3.0 MGD or less. For sewage pumping stations greater than 3.0 MGD, design will be dictated by DPW and the Design Engineer.

1. Sewage Pumping Station 3.0 MGD or More

   a. Built-In-Place Wet Well/Dry Well Sewage Pumping Station

      Built-in-place stations shall be engineered to meet the requirements of these guidelines, as well as any supplemental guidelines imposed by the Department on a case-by-case basis.

2. Sewage Pumping Station 3.0 MGD and Less

   Depending upon flow rate and motor horsepower, the sewage pumping stations shall be engineered to meet the requirements of these guidelines.

   a. Dry Well/Wet Well: Dry Well/Wet Well sewage pumping stations shall be used where flows are in excess of 500 GPM or where a submersible station would require a motor greater than 25 HP. Dry Well/Wet Well sewage pumping stations shall use vertical, non-clog type dry pit pumps and motors.

   b. Submersible: Submersible sewage pumps with guide rail and pump discharge elbow assemblies installed in the wet well shall be used for small sewage pumping stations. Submersible type sewage pumping stations shall be used at locations where design flow does not exceed 500 GPM and motor horsepower is 25 or less. If either motor horsepower or design flow limitations for submersible type sewage pumping stations are exceeded, a dry well/wet well configuration shall be used.

c. Submersible Centrifugal Grinder Pump Station less than 120 gpm and motor horsepower is less than 10 HP. A 3" force main is allowed for this type of station only.

3. Other Configurations

In special circumstances due to extraordinary sewage composition, rehabilitation of an existing installation or other reasons, the Department shall be consulted to determine the acceptability of other configurations before sewage pumping station design commences.

H. Site Improvements

Sewage pumping stations must be developed with the necessary improvements to ensure adequate and reasonable access, security, drainage and maintainability.

1. Access Road

All sewage pumping stations must provide complete vehicular access.

a. Duty and Section: Access roads should be designed to accommodate all types of vehicles at low speeds from passenger automobiles up to county designated vehicles as outlined above.. An all-weather surface with cross section design adequate to support the vehicular loads anticipated should be designed for local soil conditions. Access roads shall be a minimum 14-foot wide single lane with 2 percent cross slope to provide surface drainage. Two-foot wide shoulders on each side of the road surface shall be included with a cross slope of 6 percent (See Reference Drawings for Sewage Pumping Stations, Dwg PS-C1-3). Swales, pilot ditches and culverts as necessary shall be provided to ensure adequate storm drainage for a 25-year return frequency rainfall event. Grading and slope stabilization in conjunction with access road design shall be compatible with local soil conditions.

b. Geometry: Horizontal access road geometry shall permit vehicular movement such that vehicle tires can remain on road and shoulders at all curves. Driveway filets, curves and turning flares shall be provided at the intersection with traveled roads with a 40-feet minimum turning radius. Vertical access road geometry shall provide smooth grade transitions and adequate site angles at intersections with traveled roads. Access road grades should be limited to 8 percent, but in no case may exceed 12 percent. Access roads shall satisfy all horizontal and vertical geometry requirements for vehicles as dictated by DPW.

c. Security: Access roads longer than 75 feet in length shall include a padlocked swing gate across the access road. The swing gate shall be set back a minimum of 5 feet from the right-of-way line. Consideration may be given to access road entrance swing gate for access roads less than 75 feet in length.

2. Sewage Pumping Stations

   All sewage pumping station sites shall be improved with paved surfaces, security fences, site lighting and screening. Certain locations and attendant conditions may require other improvements, which may consist of storm drainage systems or more extensive security provisions.

   a. Perimeter Fence: All sewage pumping stations must have a minimum 7-foot high chain link fence surrounding the parking area, building, wet well, dry well, and vaults. In areas particularly subject to vandalism, higher fences and electronic security systems should be considered on a case-by-case basis. Full width sliding fence gates shall be a minimum of 2 feet wider than the driveway, with padlocked astragal shall be located to suit entry and exit of the pump station site. All exposed fencing materials shall be black vinyl coated. A two-foot wide, 6-inches thick, reinforced concrete mowing strip shall be cast beneath the perimeter fence (except across gate openings) with expansion joints spaced a maximum of 10 feet apart, and 1 foot each side of all posts (See Reference Drawings for Sewage Pumping Stations, Dwg. PS-C1-5). No razor wire is allowed to be used on fencing.

   b. Paving and Other Surfaces: Sufficient bituminous paved surfaces, within the sewage pumping station perimeter fence, shall be provided to enable the maneuvering and turning of vehicles in size up to 6,000-gallon tandem axle trucks. The paving section composition shall consist of band SF surface course, an underlying band BF and a CR-6 crushed stone base course, all of a composite thickness necessary to support all anticipated wheel loads in consideration of local soil conditions (See Reference Drawings for Sewage Pumping Stations, Dwg. PS-C1-1). The remaining surfaces inside the perimeter fence not occupied by structures shall be covered with a compacted course of No. 57 Texas White stone of thickness equal to bituminous concrete site paving and placed on a geotextile fabric with weed control barrier. A 1/4-inch x 6" epoxy or bituminous-coated steel edge strip shall be installed adjacent to paved areas to provide a protective edge for the paving.

   c. Grading: Sewage pumping station grades for paved areas shall prevent local ponding, provide positive drainage away from structures and generally be limited to no greater than 4 percent slopes. Stone surfaces around paved areas shall provide proper site drainage at slopes 10 percent or less. Land grading outside of the sewage pump station perimeter fence shall not exceed 3 to 1 slopes; 4 to 1 slope maximums are desirable. Lesser slopes wherever possible are preferred. Site grading design shall be compatible with slope stability for soils encountered. Slope stabilization shall be appropriate for the degree of slope and soil conditions. The use of retaining walls adjacent to the sewage pumping station site shall only be allowed with DPW approval.

   d. Landscaping: All sewage station sites shall be screened as appropriate for surrounding development per County Standards. Landscaping materials should

be aesthetically pleasing, require minimal maintenance (watering, fertilizing, trimming, etc.), be planted outside the fence line, and be off County property.

e. Lighting: Exterior lights shall be wall-mounted on the pump station building or properly located pole(s). All exterior lights shall be photovoltaic with Energy Star certified LED light fixtures, on a timer, and controlled by an on-off switch.

3. Structures

All structures shall be protected from 100-year floods. Structure foundation design shall be based upon geotechnical evaluation of underlying bearing stratum. The design professional shall include the geotechnical report and soil boring report in the project specifications.

a. Building: Only Dry Well/Wet Well sewage pumping stations will require a building for the electrical, control and standby power systems. These systems are to be housed in an at-grade brick and block building with wooden roof trusses and shingles. The building shall be sized to afford reasonable access to and removal of all components housed within. Details of construction shall follow the architectural, structural, mechanical and electrical standard design (See Reference Drawings for Sewage Pumping Station Design). All buildings shall be designed to comply with the 2018 International Building Code (IBC) and 2018 International Energy Conservation Code.

The control room shall be heated with an electric unit heater to automatically maintain a minimum temperature of 55º F. The control room shall be ventilated to eliminate heat buildup during the summer. An exhaust fan shall be provided. All motor operated dampers/louvers shall be of heavy-duty aluminum design and of airtight energy efficient construction.

b. Pumping Station: Sewage pumping equipment will be located in a below grade concrete structure of the type indicated for the capacity planned. The pumping station concrete structure(s) shall extend at least 12 inches above finished grade (See Reference Drawings for Sewage Pumping Station Design). Bituminous concrete paving shall surround the pumping station structure(s) and be continuous to the mowing strip. In areas where stone is used, a 1/4" X 6" epoxy or bituminous-coated steel edge strip will be used where the stone ends and paving begins to provide a crisp edge.

c. Vaults: Precast concrete vaults for emergency bypass pumping connections and valves shall have an interior epoxy paint finish and an exterior elastomeric membrane waterproofing in accordance with the Reference Sewage Pumping Station Specifications. Valve vaults for sewage pumping stations shall contain emergency connection couplings and valves and all pump discharge check valves, isolation valves, gauges and flushing connection control valves (See Reference Drawings for Sewage Pumping Station Design). Sewage pumping station vaults shall extend 12 inches above grade and shall have hatches ladders

and grab bars to access valves and emergency connection couplings. Vault dewatering will be accomplished with the use of a rubber duckbill check valve, P-trap, and drain line at 2% fall that discharges into the wet wella.

I. Sewage Pumping Station Features

Sewage pumping station structures, equipment systems, piping, controls and accessory systems must be engineered according to these guidelines to form a cohesive design integrating the intended service and operational characteristics stipulated. To fulfill the intent of these guidelines, the design professional must exercise judgment to use the special knowledge relating to project site characteristics and conditions of service (head, flow, force main, etc.) particular to the sewage pumping station design under development.

1. Wet well

Wet wells shall be considered a hazardous environment, classified as NEC Class I, Division I for possible ignition of flammable gases. Wet wells shall be designed and constructed to be as hazard free as possible, and corrosion-resistant materials shall be used throughout. All materials and equipment used in wet wells shall meet NEC Class I, Division I standards. Conduit between the junction boxes serving equipment mounted in the wet well and control building shall be sealed at the junction box with explosion-proof conduit seal.

a. Structure: Wet wells shall be constructed of reinforced concrete. Wet wells shall have precast base slabs and riser sections, and top slabs. Custom built-in-place sewage pump station wet wells shall be constructed entirely of cast-in-place reinforced concrete. The structural design of pre-cast concrete is the responsibility of the design professional. Wet wells shall have an interior corrosion resistant epoxy coating and exterior elastomeric membrane waterproofing in accordance with the Technical Specifications. Wet wells shall be adequately designed to prevent flotation. Wet well size and depth shall be as required to accommodate the influent sewer, pump suction submergence, and suction inlet clearances from the floor and walls as recommended by Hydraulic Institute Standards. Submersible pumps shall have complete pump submergence, clearance from adjacent pumps, and clearance from walls to well and appurtenances to allow hatch sizing for removing pumps. The wet well depth shall be less than 24 feet for maintenance purposes. Any depths over 24 feet shall be approved by DPW prior to design phase. The required working volume and preferred intervals between sewer and control elevations shall be determined as follows:

1) Working Volume (in Gal.) = $\frac{TQ}{4}$

T = minimum time between motor starts or 7 minutes, whichever is greater; for pumps 30 horsepower (HP) and larger, minimum cycle time shall be 12 minutes

Q = ultimate design discharge rate of one pump in operation in GPM

Working Volume = calculated volume between the lead pump on setpoint and lead pump off setpoint

2) Minimum inside width - 8 feet (considerations shall include retention time & pipe/pump configuration & access)

3) The high water level alarm setting shall be 18" minimum below the influent sewer invert.

4) Minimum elevation difference between control elevations - 6 inches

5) Minimum 2-hour storage capacity per Design Guidelines for Wastewater Facilities, published by MDE.

b. Access: Pump station wet well access shall be through a top slab opening with aluminum hatch cover and frame. The top slab access hatch shall be 48 by 48 inches minimum size or larger, as necessary to allow removal of equipment from the wet well. Permanent aluminum safety railings shall be provided around the access hatch in accordance with OSHA regulations. An aluminum ladder, rated for 300 lbs point loads with S.S. grab rail 'trees' per SPS details placed at the top shall be provided to permit safe entry. Install a tag on the aluminum ladder to indicate the 300-lbs weight rating. Rungs shall be square with serrated top surfaces. Structures 20 feet in height or more shall be equipped with removable or hinged intermediate landings as required to obtain less than 20-foot intervals. The ladder landing on the wet well floor shall be flat. Custom built-in-place wet well personnel access shall be stairs, minimum of 48-inches wide. Provisions should be made for additional wet well access openings large enough for other equipment removal where required by the design.

c. Wet Well Work Platform: Wet wells shall have an intermediate platform completely covering the wet well in accordance with the latest OSHA requirements. The work platform shall be constructed of aluminum grating sections and grating supports of structural aluminum shapes fastened to the wall. Pump station wet wells shall have an aluminum perimeter platform with handrail over the wet well and screening channel. Grating and handrails shall have a minimum load rating in accordance with the latest OSHA requirements. Seven feet minimum of headroom over work platforms is desirable. Care shall be taken to locate removable or hinged grating sections consistent with equipment placement and removal requirements. All fixed grating shall be bolted down as detailed. All fasteners and anchors are to be Type 316 stainless steel.

d. Debris Removal: All sewage pumping stations shall be designed to accommodate access for maintenance and future upgrade of debris handling equipment (i.e. comminutor). Sewage pumping stations can have manually cleaned static bar racks attached to the wet well wall and work platform (See Reference Drawings for Sewage Pumping Station Design). Static bar racks shall be of welded aluminum and stainless steel construction. Maximum clear opening between bars shall be 1¼ inches for all bar racks. Bar rack head loss shall not cause any reduction in influent sewer flow velocity. Bottom of bar racks shall be located 7 inches below the invert of the influent sewer pipe. First manhole outside the station shall be a minimum of 5 foot diameter manhole with a conduit run from the sewage pumping station capable of handling the installation of an inline grinder unit.

e. Invert Slope: Wet wells shall have sloping sides to form a hopper at the bottom of the wet well. Sewage pumping stations shall have non-shrink grout topping across the bottom of the wet well with fill slopes of 1 horizontal to 1.75 vertical (See Reference Drawings for Sewage Pumping Station Design, Dwg. PS-M1-6A and PS-M1-6B). Custom built-in-place sewage pumping station-wet wells shall have side slopes of 1 horizontal to 1 vertical if possible. The flat portion of the wet well floor shall be sufficient in area to accommodate equipment mounting, ladder landings and recommended pump suction hydraulic conditions as outlined by Hydraulic Institute standards.

f. Level Control Instrumentation: The design professional shall evaluate all level control options based on wet well design for County's approval of Schematic Design. Wet well liquid levels are controlled by independent dual level control systems. A High Wet Well Alarm float switch shall be included in the design. Level sensors within the wet well shall be located to minimize the turbulent influences of flow into the wet well. Liquid level sensors shall be located in such a manner that it is accessible from the wet well hatch or access port.

g. Odor Control: Odor control shall be provided for all pumping stations unless declared exempt in writing from the Department of Public Works. Odor control shall be continuous, provide at least 12 complete air changes per hour and be an independent stand-alone system. Air shall be withdrawn from the wet well by mechanical means. The fan assembly shall be installed outdoors and be of non-metallic, UV resistant, and weatherproof construction. The fan shall be direct drive. The fan noise shall be less than 65 dBA for daytime operation and 55 dBA for nighttime operation when measured at the nearest property line to provide minimal impact to neighboring locations.

h. Lighting: No lighting is required in the wet well unless directed otherwise during the Schematic Design.

i. Ventilation: Wet well ventilation shall be intermittent and provide at least 30 complete air changes per hour. Air shall be forced into the wet well by mechanical means rather than solely exhausted from the wet well. The

ventilation fans shall be energized whenever the access hatch is opened. The air change requirements shall be based on 100 percent fresh air. If the fan is installed outdoors, the fan assembly and housing shall be of non-metallic, UV resistant, and weatherproof construction. The fan shall be direct drive. The fan noise shall be less than 65 dBA for daytime operation and 55 dBA for nighttime operation when measured at the nearest property line to provide minimal impact to neighboring locations. Wet well ventilation shall be provided for safety purposes and not as a means for declassifying the space. Portable ventilation equipment shall be provided for use at existing submersible pump stations and wet wells with no permanently installed ventilation equipment.

2. Pump Around Vault:

   Pump around vault shall be designed with emergency bypass pumping connections, and valves.

3. Plug Valves:

   Shall be 100% port opening; 4- to 6- inch plug valves shall be quarter turn lever operators to open. Plug valves larger than 6-inches shall have geared operators with handwheels. Valve seats shall face the sewage pumps. Plug valves, if installed horizontally, shall be positioned so that when the valve is opened, the valve plug shall be at the top of the body.

4. Access:

   Sewage pumping stations shall be designed to allow access for vacuum and wash truck maintenance. The truck size shall be determined during design phase.

5. Dry Wells

   Below-grade dry wells shall be designed to provide suitable environments for operating and maintaining pumping equipment and piping systems and shall incorporate the use of corrosion resistant materials throughout. All materials and equipment used in the dry well shall meet NEC Class I, Division 2 standards. Conduit between the junction boxes serving equipment mounted in the dry well shall be sealed at the junction box with explosion-proof seal. Configuration of dry well components shall promote safe access and adequate space for equipment and valve maintenance. Proper design shall minimize hazards for maintenance personnel.

   a. Structure: Sewage pumping station dry wells shall be constructed of reinforced concrete. Sewage pump station dry wells shall have segmented precast concrete base, riser, access tube and top slab sections as necessary on a cast-in-place structural concrete base slab foundation (See Reference Drawings for Sewage Pumping Station Design). Custom built-in-place sewage pump station dry wells shall be constructed integral with the wet well and above-grade building structures. The structural design of all cast-in-place concrete is the

responsibility of the design professional. The design professional shall provide anti-flotation calculations for design of dry wells to prevent flotation. Dry well exteriors shall be waterproofed with elastomeric membrane as specified in the Technical Specifications. Dry well interiors shall have a smooth, easy to clean special coating finish as specified in the Technical Specifications. Dry well depth and size shall be adequate to provide proper clearances for maintenance and removal of all equipment.

b. Access: Pump station dry well access shall be through a top slab opening with aluminum hatch cover and frame. The top slab access hatch and precast access tube riser shall be of sufficient size to permit the removal of an assembled sewage pump or any other station component, if larger. Minimum hatch size shall be 48 by 48 inches. Removable aluminum safety railings shall be provided around the access hatch in accordance with OSHA regulations. An aluminum ladder, rated for 300 lbs point loads with S.S. grab rail 'trees' per SPS detail placed at the top of the access hatch opening shall be provided to permit safe precast concrete dry well entry. Rungs shall be square with serrated surfaces. Structures 20 feet or more in height shall be equipped with removable intermediate landings as required to obtain less than 20-foot intervals. The ladder landing area shall be sufficiently clear to permit easy ladder use and equipment removal. For custom-built stations, additional grating, plate or concrete covered access openings shall be provided directly above each pump at all levels (including roof). Grating or covers over equipment shall be designed to support the weight of removable equipment.

c. Lighting: Dry wells shall have wall-mounted LED lights. Dry wells shall have a lighting system specifically designed to provide illumination best suited for the dry well layout which may include suspended, wall, or ceiling mounted; energy efficient LED, or other types of fixtures. Dry well lighting shall be at levels adequate for routine service inspections and maintenance activities. The entrance hatch to the dry well shall be provided with a limit switch to energize the light whenever the hatch is open.

d. Ventilation: Dry well ventilation shall be an intermittent two speed ventilation system that provides an initial ventilation rate of 30 complete air changes per hour for 10 minutes with an automatic switch over to 6 air changes per hour to maintain adequate air quality and conserve heat and moisture within the dry well. Air shall be forced into the dry well by mechanical means. Dry well ventilation fans shall be energized whenever the access hatch is opened. The air change requirements shall be based on 100 percent fresh air. Dry well ventilation shall be a stand-alone system that is independent of the wet well ventilation or odor control systems. If the fan is installed outdoors, the fan assembly and housing shall be of non-metallic, UV resistant, and weatherproof construction. The fan shall be direct drive. The fan noise shall be less than 65 dBA for daytime operation and 55 dBA for nighttime operation when measured at the nearest property line to provide minimal impact to neighboring locations. Portable ventilation equipment shall be provided for use at existing submersible

pump stations and wet wells with no permanently installed ventilation equipment.

e. Heating and Cooling: Thermostatically controlled electric unit heaters shall be provided to maintain a minimum temperature of 55 degrees and provide cooling to maintain air temperature below 95 degrees in custom-built dry wells, and comply with the 2018 International Mechanical Code (IMC) or the latest version adopted by the County.

f. Humidity Control: Dry wells shall have appropriately sized wall mounted dehumidifier units piped to drain in the dry well sump. Custom-built pump station dry well dehumidifiers shall be considered on a case-by-case basis.

g. Sump Pump: Dry wells shall have a simplex float-controlled sump pump with minimum discharge capability as specified in the Technical Specifications. The sump pump shall be located in a common station drain sump. The sump pump shall have capacity to handle anticipated maximum station drain system flow from seepage, infiltration, pump maintenance or washdown activities, and shall discharge into the wet well above the high wet well alarm level or the top of the 2-hour storage level, whichever is higher. Each sump pump shall have dual check valves installed on the discharge piping as an additional means to protect the sump pump from siphoning wastewater from the wet well back into the dry well. All dry wells shall be provided with a float switch (dry contact) to send an alarm signal to SCADA/RTU in order to indicate dry well flooding.

6. Pumping and Piping System

All sewage pumping stations shall have multiple pumping units provided. Where only two units are provided, they shall be of the same size. Sewage pumping stations shall be capable of delivering the design flow rate with the largest pumping unit out of service. Sewage pumping station design shall permit individual pump maintenance while maintaining the station in operation. Suction and discharge piping must be supported rigidly at or near the pump connections. Supports shall be designed and placed to avoid vibration.

a. Piping: The minimum size for sewage piping (except surge relief valve discharge piping and centrifugal grinder pumping stations) shall be 4 inches. Pump suction piping velocity should be within the range of 2½ to 5 feet per second. Pump discharge piping shall be sized to provide velocities in the range of 2½ to 7 feet per second. The pump discharge piping consists of the pump discharge through the pump around vault downstream of the drywell and/ or wetwell. Pump suction pipes shall be flared, have free and smooth unobstructed bellmouth openings in the wet well, and shall be designed with a gradual slope from the opening upward to the pump, in accordance with Hydraulic Institute Standard. Individual suction pipes are required for each pump. Flooded pump suction is required under all normal conditions of operation. Pump suction piping design and installation shall not permit the accumulation of air in the

suction piping or induce excessive turbulence in the pump suction area. Long radius suction piping bends shall be used whenever possible, and eccentric reducers are to be used with flat side up to prevent formation of air pockets. Sewage pumping stations shall have adequate piping and fittings to permit station bypass pumping with portable above-grade pumps (see Section III for further details). All dry well mounted sewage pumps shall be provided with casing drains with ball valve shut-offs installed either on the pump suction elbow or on the suction line between the pump and suction isolation valve. Take-off nipples shall be Schedule 80 stainless steel. Pipe nipples must not be installed in a tapped hole in piping. Use either a welded-on "thread-o-let" connection or service saddle. All dry well mounted sewage pumps shall be provided with casing vents with ball valve shut-offs installed either on the top of the pump discharge nozzle or on the discharge line between the pump and discharge check valve.

b. Valves: Each sewage pump shall have isolation valves to permit the removal or maintenance of the pumps without affecting the operation of remaining pumps. Isolation valves shall be non-lubricated plug valves. Plug valves shall be 100% port opening; 4- to 6-inch plug valves shall be quarter turn lever operators to open. Plug valves larger than 6-inches shall have geared operators with handwheels. Plug valves shall be positioned so that when closed, the valve seat is facing the wet well on the suction pipes and the pump on the discharge pipe. Plug valves, if installed horizontally, shall be positioned so that when the valve is opened, the valve plug shall be at the top of the body. See Reference Sewage Pumping Station Section 15210.02.J for plug valve specifications. Each pump shall have a discharge swing check valve to prevent backflow through pumps. In accordance with the criteria for water hammer control, check valves shall be of the type and strength required to eliminate water hammer damage.

c. Pump Around Vault: Sewage pumping stations shall have additional pipe, valves, fittings and couplings as necessary to permit bypassing the station. This vault should be provided with a gravity drain discharging into the wet well. A mud valve shall be provided in the bottom of the vault to close the drain line. The pump-around piping connections shall be housed in a buried precast concrete vault with aluminum access hatch and be easily accessible from grade. Quick-disconnect stainless steel cam-lock couplings shall be provided for connecting portable pumps to pump-around piping for up to 6 inches. A 6-inch by 4-inch coupling adapter with a dust cap shall also be provided with the connection. For larger stations, riser pipes shall be sized for bypass pumping where the velocity does not exceed 10 fps. Sewage pumping stations must have an on-site manhole upstream of the wet well to serve as an emergency wet well for portable pump use.

d. Flow metering: Dedicated station discharge flow metering and electronic flow recording devices shall be provided for all stations. Where dedicated flow metering equipment is not provided, provisions shall be made for utilizing

portable flow metering devices in the future. The design professional shall consult with the DPW to determine requirements for flow meters prior to design. For the devices employed by the Department, five upstream and five downstream pipe diameters of straight pipe. Additional length of straight piping is desirable. Meters shall have a remote transmitter. Other remote or wireless collection system monitoring components shall be provided, including rain gauges and water-level sensors inside manholes at key locations to give early warning of potential spikes in the influent to the pumping stations.

e. Sewage Pumps: All sewage pumps shall rotate in the same direction as viewed from the motor end. Sewage pumps shall be centrifugal non-clog solids handling pumps capable of passing a 3-inch sphere, and meet all requirements of MDE. Pump motors shall operate on 460 volt, 3 phase, and 60 cycle electrical service and at a speed no higher than 1780 rpm. Pump motor horsepower shall be non- overloading over the entire impeller curve selected.. Sewage pumps and motors shall be suitable for continuous duty. Motors shall be inverter duty rated.

   1) Wet Pit Submersible Sewage Pumps: Submersible sewage pumps shall have 4-inch minimum discharge size. Pumps shall be rated explosion-proof per NFPA Standards. Pump volute, impeller and motor housing shall be of cast iron construction. The pump volute casing and impeller shall be fitted with replaceable stainless steel wear rings to maintain sealing efficiency between the pump volute and impeller. At the Department's option, other special pump materials may be required for a particular application. The motor shaft shall be a single piece heat-treated high strength alloy steel or high strength stainless steel having a tapered end with keyway to receive the impeller. All nuts, bolts and screws shall be 316 stainless steel. The motor shall be Class F insulated (minimum) and sealed from the pump by independent double mechanical seals. All mating surfaces where watertight sealing is required shall be machined and fitted with a rubber O-ring. The machining of mating surfaces shall provide metal to metal bearing on sealing surfaces without crushing the O-ring. Submersible sewage pump stations shall feature stainless steel guide rails and quick connect cast iron discharge elbow system provided by the pump manufacturer and permanently installed in the wet well for removing pumps.

   2) Dry Well Sewage Pumps: Dry well sewage pumps shall have 4-inch minimum discharge size. Pumps shall be vertical built-together design. Dry pit submersible pump shall be evaluated on a case by case basis subject to DPW approval. The pump casing/volute, impeller, support base, suction elbow, seal housing/motor adapter and motor housing shall be of cast iron construction. The pump’s casing and impeller shall be fitted with replaceable hardened stainless steel wear rings to maintain sealing efficiency between the volute and the impeller. Impellers shall be able to pass a minimum 3-inch diameter solid. At the Department’s option, other pump materials may be required to suit a particular application. In special

circumstances due to extraordinary hydraulic applications, rehabilitation of an existing installation or other reasons, the Department shall be consulted during Schematic Design to determine the acceptability of other pump configurations before sewage pumping station design commences.

Vertical built-together pumps shall have the following additional features:

- One-piece backhead and motor adapter with impeller adjustment cap screws;
- Solid full diameter stainless steel shaft without a shaft sleeve or with a solid large diameter steel high strength alloy steel shaft with stainless steel shaft sleeve;
- A single, flushless, self-purging mechanical seal design not requiring any supplemental external lubrication or cooling shall be provided, unless design criteria requires otherwise;
- Premium Efficiency motors shall be specified (where commercially available) for all three-phase pump motors.

3) Grinder Sewerage Pumps: See the pump requirements for submersible sewerage pumps above.

- Grinder mechanism: The stationary cutter shall be circular in design and contain evenly spaced cutting slots that extend outwards from the inlet of the pump. The slots are tapered inward toward the inlet to help direct slurry through the cutting slots into the pump. The slots are to be angled, or undercut, to help maintain a sharp axial cutting edge, even as the axial face wears during use. The stationary cutter shall be pressed into the suction opening of the volute and held in place by four 300 series stainless steel screws. The stationary cutter shall be provided with tapped back-off holes so that screws can be used to remove the cutter from the volute. The rotating cutter shall contain three axial cutting arms extending from the hub, perpendicular to the pump shaft, that are shaped to aid in the rejection of suspended debris that has been sufficiently reduced in size by the axial cutting action. The grinder shall be capable of reducing all components in normal domestic sewage, including a reasonable amount of "foreign objects," such as paper, wood, plastic, glass, wipes, rubber and the like, to finely-divided particles which will pass freely through the passages of the pump

f. Pump Removal: Dedicated lifting devices for sewage pump removal shall be provided for periodic maintenance or overhaul. Pump removal through the access way will be accomplished by a truck mounted boom hoist positioned over access openings. A minimum five feet of clearance shall be provided between the top of the pumps and the pump hoist lifting hook. Wet well/dry

well sewage pumping stations shall be furnished with pump removal devices properly sized and rated for the load.

g. Gauges: Pressure gauges shall be glycerin filled analog. Stainless steel, ½ gauge connection ports with spring return shut-off ball valves shall be included on all pump discharge mains and suction lines (dry well/wet well installation). Pressure gauge assembly shall be in accordance with Specification Section 15210.02.O.

7. Pump Station Emergency Power

To ensure that utility power failures do not cause sewer system overflows, provisions to maintain sewage pump station operation with an onsite standby power supply shall be made.

a. On-Site Power Generation: Sewage pumping stations require a diesel engine driven emergency electric generator to be provided. Stationary generator engines shall meet EPA Tier 3 emission requirements, and portable generators shall meet Tier 4 requirements. The generator shall be sized to allow all pumps to operate with a staggered start plus other station loads. Pumps shall start with a maximum voltage dip of 20% for constant speed/across-the-line starting. An automatic transfer switch shall be provided to switch to emergency power on a power failure or a drop in any phase voltage. A free-standing, aboveground double-walled diesel fuel tank shall be provided in a separate generator room for interior installations; or skid-mounted, double-walled fuel tank under generator unit for fuel storage for exterior installations. The fuel tank shall be the smallest available size to give a 24-hour fuel supply at full running load of the pump stations. The design shall include provisions for attenuation of noise from the generator in conformance to County Noise Ordinance (65 dBA Daytime and 55 dBA Nighttime for residential receiving properties as measured at the property line).

8. Miscellaneous

a. Motor Control Center: Reference specifications for sewage pumping station motor control centers are provided in the Reference Sewage Pumping Station Specification. In addition, diagrams of the motor control center layout and standard pump operation electrical control circuits are provided in the Reference Drawings for Sewage Pumping Stations. Standard motor control center layout shall be provided with the following minimum section of panels:

- Main circuit breakers
- TVSS (Transient Voltage Surge Suppression)
- Automatic transfer switch

- Circuit breakers and starters for unit heaters, sewage pumps, fans, compressors, lighting transformers, etc.

- Space for miscellaneous components such as spare breaker(s), spare starter(s), etc.

b. Water System: Where public water is available, a one-inch metered connection with 1½ inch service line from the existing water system shall be provided. A backflow prevention device shall be installed after the water meter and prior to any outlet onsite. The backflow prevention device shall be located inside when a building is required. Otherwise, an above grade heated enclosure shall be provided for the backflow prevention device. Design shall include a minimum of ¾" outlet onsite frost proof yard hydrant, with anti-siphon device installed. When a building is provided a ¼ turn, ¾" outlet non-freeze flush mounted wall hydrant with exposed hose connection shall also be provided. A 50 foot length of hose with spray nozzle shall be supplied. If there is no existing water supply system, the Department will determine the need for and location of well and equipment at the station.

c. Convenience Receptacles: 120 volt, 20A, single-phase receptacles shall be provided within the pump station buildings or electrical equipment enclosures. In addition, two (2) GFCI duplex lockable outdoor weatherproof outlets shall be provided. One shall be in proximity to dry well and/or wet well and a second GFCI Outlet shall be provided for the Portable Load Bank Connections Box described below.

d. Portable Generator Connection: Pump station buildings shall have a through-wall 4-inch diameter galvanized pipe sleeve, as shown in Reference Sewage Pumping Station Details, with removable capped ends to permit the passage of temporary power cables.

e. Coatings and Painting: In general, all exposed construction materials and equipment shall be field painted or have some other form of field-applied protective coating in accordance to Specification Section 09900. Stainless steel, galvanized steel, aluminum, interior PVC, and brick are excluded. Factory finished items do not require field painting if the factory finish conforms to the specified paint system and color. Painting unfinished materials shall be in accordance with the specification. Paint and other coatings shall be utilized as necessary to prevent corrosion, extend wear or promote easy to clean surfaces. Paint and coating systems used at sewage pumping stations must exhibit superior durability.

f. Testing: The installation of mechanical and electrical equipment in accordance with these design standards requires, upon completion and prior to final inspection, field testing to ensure the standards are met and to maintain quality control. Electrical testing procedures which apply to all electrical equipment, vibration testing procedures which apply to dry well/wet well installations, and

load bank testing procedures which apply to all standby generators are included in the County's Reference Pumping Station Specifications.

g. Final Inspection Checklist: Prior to sewage pumping station acceptance as a part of the Anne Arundel County Sewerage System, a thorough inspection and operational check of the station is required in the presence of a representative of the Department. A typical pump station conditional acceptance checklist and start up test procedures are enclosed in the County's Reference Pumping Station Specifications. Each sewage pumping station design shall be submitted with a start up test procedure and checklist tailored to the individual station.

h. Training: Upon Final Acceptance, training sessions shall be provided for County operations and maintenance personnel. Training sessions shall include hands-on training with manufacturer supplied demonstration equipment to consist of an actual equipment or system as required per the standards and specifications.

i. Fall Protection: The design professional shall design and specify temporary and permanent fall protection for all floor and wall openings in the pumping station in accordance with the requirements of the latest edition of OSHA 29 CFR 1910.23 Walking Surfaces and 1910.140 Personal Fall Protection Systems. Fall protection includes, but is not limited to railings, toe boards, screens, covers, hatches, grills, slats and fences. Floor openings include, but are not limited to, ladderways, hatchways, trap doors, chute openings, pits and manholes. Wall openings include, but are not limited to chute openings, low windows, temporary openings and openings where there is a hazard of material falling through the opening. Open sided floors, platforms and runways used for equipment or machinery maintenance or vehicle loading or unloading shall likewise be protected in accordance with the same OSHA regulations.

J. Vibration and Alignment Standards

The design professional is directed to include vibration design alignment and installation requirements as indicated in Section 15990 of the Reference Pumping Station Specifications.

K. Corrosion Protection

The design professional shall evaluate whether or not the pumping station requires protection using cathodic protection systems. A cathodic protection (CP) survey shall be performed according to NACE International Standard SP0169.

L. Energy Conservation

To ensure that the sewage pumping station conforms to 2018 International Energy Conservation Code, or the latest code adopted by the County on energy conservation. Premium - efficiency motors shall be provided for all non-submersible, three-phase motors, one horsepower or greater.

M. Minimum HVAC Requirements

Design shall meet all AMCA, ANSI, ASHRAE, NEC, NEMA, SMACNA, UL, and NFPA latest codes and standards in addition to requirements included in Section 15600 of the Reference Sewage Pumping Station Specifications .

N. Power Requirement

The electric service shall be 277/480-3ϕ-4W. The service shall be sized to allow the maximum load from all equipment.

O. Minimum Architectural Standards

See Section II. Paragraph G.3 and the Reference Drawings for Sewage Pumping Station for the standard architectural requirements at the sewage pumping station.

P. Security Systems

The design professional shall include in their design, security systems at the sewage pumping stations. The security systems shall include entrance alarms as needed for all access points of the wet well, dry well, emergency storage, and buildings. Consult the Department for special requirements.

Q. Compatibility with Surrounding Planned Development

See Section II. Paragraph E. for the sewage pumping station compatibility with the surrounding planned development.

R. Lightning and Surge Protection

The design professional shall provide lightning protection in accordance with the latest edition of the following publications:

- NFPA 780: Lightning Protection Code
- UL 96: Lightning Protection Components
- UL 96A: Installation Requirements for Lightning Protection Systems
- LPI-175: Lightning Protection Installation Standard
- LPI-177: Inspection guide for LPI Certified Systems

The design professional shall provide transient voltage surge suppressors (TVSS) on service, branch circuits, and at utilization point. TVSS shall be applied in accordance with the following publications or latest versions thereof:

- IEEE 142: Recommended Practice for Grounding of Industrial and Commercial Power Systems. 2007.
- IEEE 241: Recommended Practice for Electric Power Systems in Commercial Buildings (the Gray Book). 1990.
- IEEE 242: Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems (the Buff Book). 2001.
- IEEE 1100: Recommended Practice for Powering and Grounding Sensitive Electronic Equipment. 2005.
- UL 1449: Standard for Safety, Transient Voltage Surge Suppressors, Latest edition.
- National Fire Protection Association. The National Electrical Code 2020 Handbook.
- IEEE C62.41.1-2002: Guide on the Surge Environment in Low-Voltage (1000 V and less) AC Power Circuits.
- IEEE C62.41.2-2002: Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and less) AC Power Circuits.

S. Confined Space Entry Warnings

The design professional shall be aware of the warnings and dangers of confined spaces when designing the sewage pumping station. The following are regulations and publications for the design professional to get familiar with the cautions and safety standards for confined spaces.

- COMAR 09.12.35, Maryland Occupational Safety and Health Standards for Confined Spaces.
- OSHA 29 CFR Part 1910, Permit Required Confined Spaces.
- NIOSH (DHHS) Publication No. 87-113, A Guide to Safety in Confined Spaces.

T. Remote Terminal Units

1. General

Remote terminal units (RTU's) shall be specified for sanitary sewers and/or pumping stations. The County will provide the design professional with information on how the existing control master system screen displays are to be

updated, what reports, if any, need to be updated by information received from the additional RTU's, current manufacturers and model numbers of equipment and existing software in use by the County. All equipment and software must be compatible with the County's existing SCADA system.

2. RF Path Study

The design professional shall perform an RF path study as part of the project design effort. The RF path study is used to verify communications reliability between the proposed RTU location and the existing control master unit or the nearest radio communications hub. The County will furnish the design professional with any information, which it has acquired from its preliminary County-wide RF path studies, which may be applicable to the project.

3. Telemetry

Where the RF path study indicates it is feasible, UHF and VHF radio will be used to transmit signals between the RTU's and the Emergency Dispatch Center.

III. CONTRACT DRAWINGS AND DOCUMENTS

A. Specification

Specifications shall be submitted as stipulated in Chapter I, General Instructions. Standard specification, training, and Operation and Maintenance manuals shall be considered in the development of the specifications.

1. Standard Specifications

Specifications for the sewage pumping stations shall conform to the Anne Arundel County Standard Specifications and the Reference Pumping Station Specifications.

2. Training of County Personnel

The design professional shall incorporate into the specifications the services of a manufacturer's representative to conduct group training of the County's designated personnel in the operation of each appropriate system. Manufacturer's representative must be a factory-trained employee of the manufacturer. Sales representatives will not be considered to be acceptable. Include instruction covering basic system theory, operating principals, and adjustments, routine maintenance and repair, troubleshooting and "hands-on" operation. The number and duration of the group training sessions, as well as the specific systems for which training is required, shall be jointly determined by the design professional and County operations personnel. Provide a detailed list of trainings to be provided during design development.

3. Operation and Maintenance (O&M) Manuals

   The O&M manuals shall be prepared in accordance with the General Provisions 5 and the format and chapter outline shown in the Design Standards.

4. Spare Parts

   The design professional shall review with DPW the spare parts requirements prior to the Bid Phase. A detailed list of spare parts shall be provided.

5. Start-Up Assistance

   The design professional shall incorporate into the specifications the services of a manufacturer's representative for a minimum of two (2) working days to assist the County's personnel during start-up of the system. The purpose of this assistance is to support in making final adjustment of settings on the instrument systems within the sewage pump station.

6. Asset Management Tracking

   The design professional and construction firm shall be responsible for capturing facility assets and the associated attribute data. The data shall be captured using the Asset Attribute Template in Appendix D. The asset data shall be recorded and entered in accordance with the procedure found in the Asset Attribute Standard Operating Procedure, Appendix C.

IV. APPENDIX

A. Design Checklist

B. Conditional Acceptance Checklist

C. Asset Attribute Standard Operating Procedure

D. Asset Attribute Template

DESIGN CHECKLIST

The following checklist is provided to assist the design professional in designing the sewage pumping station. Compliance with the checklist, however, in no way is meant to relieve the design professional of responsibility for project design.

Project: _____

Date: _____

Checked By: _____

DESIGN CRITERIA

_____ Design Flowrate Calculations

_____ Approved Drainage Area Study

_____ Hydraulic Analysis

- _____ Pump / System Curve
- _____ Water Hammer / Surge Analysis
- _____ Surge Valve(s) and/or Cushioned Pump Check Valves (if required)
- _____ Air Release and Air / Vacuum Valves
- _____ Blowoffs (if required)
- _____ Site Selection
- _____ Topography
- _____ Access
- _____ Floodplain
- _____ Wetlands
- _____ Land Use
- _____ Aesthetics
- _____ Overflow
- _____ Ownership

_____ Type of Sewage Pumping Station Selected

_____ Emergency Wastewater 2-Hour Storage requirements

_____ Site Design

- _____ Access Road (Security, Geometry, Duty and Section)
- _____ Sewage Pumping Station Site
  - _____ Perimeter Fence
  - _____ Paving
  - _____ Grading
  - _____ Landscaping
  - _____ Lighting
- _____ Structures
  - _____ Building
  - _____ Pumping Station
  - _____ Vaults
- _____ Security Systems and Safety (if applicable)

_____ Pumping Station Design

- _____ Wet well
  - _____ Structural
  - _____ Access, hatches, ladders
  - _____ Work Platform
  - _____ Bar Rack/ Grinder
  - _____ Wet well Size and Configuration
  - _____ Wet well Level Control
    - _____ PLC
    - _____ Level sensing type and location

_____ High wet well level alarm float to SCADA

_____ Odor Control

_____ Lighting

_____ Ventilation (NFPA 820)

_____ Dewatering

_____ Drywell

_____ Structural

_____ Access

_____ Lighting

_____ Ventilation (NFPA 820)

_____ Heating

_____ Humidity Control

_____ Sump Pump

_____ Pumping and Piping System

_____ Piping

_____ Valves

_____ Bypass Arrangement

_____ Flow metering

_____ Pumping Units

_____ Pump Type and Special Material Requirements

_____ Pump Removal / Hoisting / lifting eye provisions

_____ Pressure Gauges

_____ Pump Vents / Drains

_____ Type of Station Control System

_____ Normal and Emergency Power Supply

_____ Emergency Diesel Bypass Pumping System

_____ Remote Terminal Unit/ SCADA

_____ Communicator

_____ Vacuum Truck and Maintenance Access

_____ Emergency Station Operation

_____ Water System

_____ Portable Generator Connection

_____ Generator Load Bank Connection

_____ Receptacles

_____ Painting

_____ Wet Well Interior Coatings

_____ Exterior Membrane Waterproofing – Wet Well, Dry Well, Vaults

APPENDIX B

PUMP STATION CONDITIONAL ACCEPTANCE CHECKLIST AND START-UP TEST PROCEDURES

DATE: ____/____/____

PROJECT NAME: _____

INSPECTOR: _____

CHECK OFF

1. Review Inspector's Checklist and recheck items that are not marked completed.

2. <u>OPERATOR / TECHNICIAN TRAINING</u>

_____ Pumps and motors

_____ Grinder

_____ Valves and actuators

_____ Motor control center

_____ Instrumentation systems

3. <u>SPARE PARTS</u>

_____ Number required (attach required list - indicate parts provided)

_____ Condition/preservation (list discrepancies)

_____ Released to Operations

_____ Released to Maintenance

4. <u>OPERATION AND MAINTENANCE MANUALS</u>

_____ Specified number of hard copies and electronic copies delivered

5. <u>TESTING/ ACCEPTANCE PREPARATION</u>

<u>PUMP STATION EQUIPMENT</u>

_____ Manufacturer’s installation certificates completed and signed.

_____ PLC program loaded, tested and 'debugged' by County.

SCADA

_____ Communications and station alarms established with Millersville.

NOTE: Items 1 thru 5 to be completed prior to walk through, conditional acceptance.

6. CONTROLS AREA

ELECTRICAL

_____ MCC: General condition, breakers on, indicator lights working, buckets and compartments clean of dust, wiring debris.

_____ Pump Control Panel: General condition, breakers on, indicator lights working, interior lights, convenience receptacle working, interior clean of dust, wiring debris.

GAS DETECTOR

_____ Detector installed, operational and calibration certification

_____ Wet well gas detection alarm panel tested and operating

7. WET WELL

_____ Explosion proof junction boxes at grade. Remove lids and make sure seal offs are filled. Replace lids and secure.

_____ Wet well supply fan operation. Ventilation fan guard/motor support. Fan case condensate drain. Rain hood and bird screen.

_____ Gooseneck vent pipe: Birds screen in place, vent painted.

_____ Wet well ventilation fan automatically comes on and operates continuously when the wet well hatch is open.

_____ Joints sealed/ good workmanship. No infiltration or inflow observed

_____ Check pipe and conduit penetrations and seals for leaks

_____ Combustible Gas Detection sensor easily accessible from ladder for maintenance.

_____ Wet well ventilation pipe properly supported and proper distance above grating or floor.

HATCHES

_____ Corrosion resistant hardware and fasteners

_____ Automatic hold open device(s).

_____ Slam latch with removable key, spare keys furnished

_____ Flush handle

_____ Hatch drain to wet well

LADDER

_____ Aluminum construction

_____ Rungs 1-inch square

_____ Maximum run spacing 12 inches on center

_____ Non-skid grooves on top of rungs

_____ Minimum dimension from wall to centerline of rung is 7- inches

_____ No toe interference behind rungs at any location (no pipes, conduits, etc.)

_____ Ladder properly secured to structure

_____ Locking extension poles as specified

8. VALVE VAULT

_____ Joints sealed/ good workmanship. No infiltration observed.

_____ Check pipe and conduit penetrations for leaks.

_____ Exercise all valves from full open to full closed (control flow to prevent spills)

HATCHES

_____ Corrosion resistant hardware and fasteners

_____ Automatic hold open device(s).

_____ Slam latch with removable key, spare keys furnished

_____ Flush handle

_____ Hatch drain piped to finish grade

9. BYPASS SYSTEM

_____ Pump around connections and valving as specified

_____ Male couplers with dust caps on brass chain in place

_____ Grade level valve boxes as specified

_____ Exercise all valves from full open to full closed (control flow to prevent spills)

10. SITE

_____ Paving as specified, no birdbaths

_____ Site graded to prevent ponding and flooding

_____ All grass areas growing and as specified; four inches of topsoil required

_____ All trees and shrubbery alive and as specified

_____ Stone provided over vinyl cloth weed barrier as specified

_____ Check operation of swing gates and slide gates

11. DRY WELL

_____ Ventilation supply and exhaust fans working. Ventilation fan guard/motor support

_____ Ductwork properly secured. Fan case condensate drain. Rain hoods, bird screens.

_____ Dry well ventilation air flow monitoring alarm panel working. Both fans “on” should give Green light. Turn off one fan should give Red light and RTU Alarm.

_____ Joints sealed / good workmanship. No infiltration observed.

_____ Check pipe and conduit penetrations, pump hand hole covers and flanges for leaks.

_____ Exercise pump valves from full open to full closed (control flow to prevent spill)

_____ Pump piping flexible connectors/ expansion joints- check for leaks/tie rods in place

_____ Check valves: Caps tight, lever weights adjusted, springs adjusted, no back leakage, no slamming when closes after a pump stops.

12. PUMP AND PUMP STATION CONTROL TESTING

_____ Begin filling wet well

_____ Check pump starters/ VFD to insure that HAND or MANUAL mode for each pump works. Pump down in Hand to lead stop level or slightly below.

_____ Return starters/ VFD's to AUTO. Continue to refill wet well

_____ Lead Pump on @ Wet Well Level _____

_____ Turn Lead Pump off. Continue to fill wet well

_____ Lag Pump on @ Wet Well Level _____

_____ Lag Pump Required Alarm Rec'd (RTU)

_____ Turn Lag Pump off. Continue to fill wet well

_____ High Level Alarm Rec'd (RTU) @ Wet Well Level _____

_____ High Level Alarm @ Pump Ctrl Panel Wet Well Level

_____ Return starters/ VFD's to AUTO. Both pumps should start

_____ Lag pump stop @ Wet Well Level _____

_____ Lag Pump Required Alarm clears (RTU)

_____ Lead pump stop (note Lead pump #) @ Wet Well Level _____

_____ Refill wet well to Lead Pump on level. Check that Lead pump alternated

_____ With Lead pump running, simulate power failure by opening main pumping station breaker

_____ Check generator operation/ start

_____ Power transfers in specified times

_____ Lighting available

_____ Alarm signals received at Millersville: Generator Run, ATS Emergency Power, Station Power

_____ PLC controls/ pressure transducer controls reboot

_____ At least one pump comes back on automatically. Turn off and let wet well fill to lag pump start level.

_____ Put lead pump back in auto and let both pumps run on generator simultaneously until both pumps stop

_____ Check generator operation, look for coolant or oil leaks, unusual noises, appearance of exhaust

_____ Restore Normal power to station by reclosing main breaker

_____ Power retransfers to Normal power in specified time. RTU power alarms clear at Millersville

_____ PLC controls/ bubbler controls reboot

_____ At least one pump comes back on automatically.

_____ Generator continues running for 5 minute cool down, then shuts off

_____ Alarm signals back to normal at Millersville

13. RELIABILITY TESTING

_____ Operate pumping station in recirculation mode or live force main mode as agreed between the contractor and County and for the number of days specified

_____ Testing/acceptance per Specifications

_____ Check amp draw: Pump #1 _____ Pump #2 _____

_____ Check GPM vs. TDH for each pump: GPM TDH

Pump #1 _____ _____

Pump #2 _____ _____

_____ Check that measured operating conditions meet design conditions.

14. _____ ALL PUNCHLIST ITEMS COMPLETED BY CONTRACTOR

15. AS-BUILT DRAWINGS

_____ Red-lined copies provided to county for processing

16. _____ CONDITIONAL ACCEPTANCE SIGN-OFF

cc: (When completed:)

Contractor: _____

Construction Management: _____

Design Engineer: _____

Project Engineer: _____

PUMP PERFORMANCE TESTING

PART 1 - General

A. Pumps shall have a completed operational performance test as installed on site. This performance test is to ascertain that the pumps and motors are actually operating as designed and that specifications have been met. Each pump shall be tested to show that it operates quietly without heavy vibration, cavitation, bearing overheating, etc., under operation conditions. (Also, see vibration performance testing, Appendix D).

B. Pump testing should be carried out by personnel qualified to measure pump performance and shall be done in the presence of the manufacturer's representative. An authorized representative of the County shall also witness the tests.

PART 2 - Equipment to be Tested:

A. Pumps

B. Pump motors

PART 3 - Testing Prerequisites:

A. A schedule should be agreed upon by all parties in advance of the test. The schedule should be as complete a program as possible and give particulars on the range of hydraulic conditions to be tested.

B. Flow path established for pump tests (i.e. recirculation to wet well or pumping through force main).

C. All measuring devices and instrumentation should be calibrated and adjusted prior to testing. Calibrated pressure test gauges shall be used for head measurements.

D. On coupled motor/pump arrangements shafts shall be checked and verified for proper alignment, coupling gap settings and lubricated if necessary.

E. All pump clearances shall be properly set as recommended by the manufacturer to suit anticipated operating conditions. These shall be recorded and included in the final test report and also included in Operations and Maintenance (O&M) manuals.

F. Prior to testing, pump bearings, motor bearings, and splines and steady bearings

shall be checked for proper lubrication.

G. Proper impeller rotation shall be verified for each pump under normal power and emergency power. Phase of 3-phase power shall be checked for both conditions.

H. On satisfactory completion of preliminary inspections the pumps can be lined- up, and primed and then started. The pumps, motors and instruments should be checked for proper operation, scale readings, evidence of malfunction or obvious mechanical problems. When equipment is determined to be functioning properly the tests shall then be conducted.

PART 4 - Test Parameters

A. As a minimum, the following values are to be measured on-site and compared against design conditions/values:

a. Capacity vs. head for each pump. As a minimum this will include readings as near normal operating conditions as possible and at shut-off head (except positive displacement pumps) and marked on shop drawing/performance curves.

b. Net positive suction head (NPSH) available over entire normal operation range to ensure that proper suction conditions are being met and marked on performance curves. The NPSH available at installation shall exceed the NPSH required over the normal full operating range. This will require use of suction pressure gauges installed with equipment and/or portable gauges.

c. Pump speed (not required on submersible style pumps).

d. Motor voltage between each phase and ampere draw on each phase at normal operation conditions. Voltage unbalance between phases shall not exceed 2%. Maximum current unbalance not to exceed 5%.

e. Motor and pump bearing temperature rise. Note any deficiencies and actions to be taken to correct.

f. Motors shall be megger tested on each phase and results recorded and included in O&M manuals. Megger testing is to be performed from MCC terminals on load side of starter. Readings of less than 1 megohm must be investigated and corrective actions taken. Submersible pumps and cable shall be megger tested as follows:

i. Each pump and power cable shall be meggered dry (each phase) before they have been submerged for the first time on-site.

ii. Pumps will then be submerged to the normal working level. After a minimum of two (2) hours submergence the pumps and cable shall be meggered again and results recorded.

g. Pump and motor vibration (see section on vibration testing, Appendix D).

PART 5 - Documentation

A. Factory certification that pumps will perform at each design condition.

a. Motor certifications.

b. Pump installation certificates.

c. Pump service card submitted.

d. Shaft alignment certification.

e. Shop drawings with performance curves.

f. A final performance and inspection report shall be submitted containing complete records, including any notes or comments on inspection, readings, observations and other information relative to the testing of the pumps. Sample forms for field acceptance tests is shown at the end of this section and may be used as a guide for inclusion into the O&M manuals. All actual operating conditions tested are to be compared against design and summarized in the report. All problems, findings or corrective actions necessary to bring equipment into compliance shall also be well documented.

RECORD OF PUMP PERFORMANCE TEST

STATION NAME _____

MOTOR/PUMP NO._____

GPM_____ RPM _____ VAR/CONST.

MOTOR HP _____ MGFR _____

DESCRIPTION/CONDITION:

_____

_____

SHAFT ASSEMBLY DESCRIPTION/CONDITION

_____

_____

PUMP SIZE_____CAPACITY _____ MANUFACTURER

IMPELLER_____ROTATION

PACKING/SEALS _____ INSPECTION PLUG_____

BASE & FOUNDATION:

DESCRIPTION _____

CONDITION _____

OBSERVE OPERATION

VIBRATION _____

CAVITATION _____

NOISE _____

HEAT _____

VIBRATION DATA AVAILABLE (yes) (no)

1. PURPOSE

1.1. To establish procedures for designating assets to be added to the Anne Arundel County CMMS database and coordinating the capture of nameplate attributes for those assets.

2. APPLICATION

2.1. This procedure applies to all personnel responsible for designing and planning construction projects with facility assets, capturing attribute data for facility assets, and creating facility assets in the CMMS database.

3. DEFINITIONS

3.1. Not Used

4. PROCEDURE

4.1. **Design Phase**

4.1.1. For CIP projects, the *Anne Arundel County BUO Asset Attribute Template* will be provided as part of the project scope and available for completion when the design contract is awarded.

4.1.1.1. For developer projects, the Asset Attribute Template will be provided by the County to the design professional for completion.

4.1.2. While reviewing design drawings, the spreadsheet shall be populated with assets that meet the criteria outlined in Tab 1 (Asset Classes and Definitions) of the document.

4.1.3. When an asset is identified on the drawings, the Design Engineer shall find the associated tab for that asset type and fill out all applicable columns with yellow headers.

4.1.3.1. The yellow columns on the spreadsheet must be completed by the Design Engineer during the Construction Document and Bid Document phases.

4.1.4. Column instructions.

4.1.4.1. **Check if Replacement in Kind** - Check the box if the asset was a replacement and the old asset should be removed from service.

4.1.4.2. **Type** - Choose from the drop down list a sub-type for the asset. Ex. Pneumatic vs. Electric, Gear Driven vs. Direct Driven, etc.

4.1.4.3. **Equipment Tag** - Enter the tag number/ ID provided on the drawing (Ex. FIT-123). Leave blank if no tag number/ ID is provided.

4.1.4.4. **Process** - Choose from, the drop down list, a water or wastewater process that the asset is critical to.

4.1.4.5. **Location** - Describe where in the facility the asset is located. Ex. Chemical Building Basement.

4.1.4.6. **Description** - Describe identifying information about the asset such as sequence or parent information. Ex. “Blower # 01”, “Check Valve, Raw Pump # 01”, “Motor, Secondary Clarifier # 01”, etc.

4.1.4.7. **MCC ID / Name.** If an asset such as a Magnetic Starter or VFD is in a motor control center, enter the name of the MCC such as MCC-1.

4.1.4.8. Note that all columns may not be applicable for a specific asset.

4.1.4.9. All exceptions to the spreadsheet shall be notified to CMMS Administration to review and make changes.

4.1.4.9.1. Exceptions include new or alternate asset types not identified in the document.

4.1.4.9.2. Items missing from a drop down list

4.1.5. Prior to the completion of the Bid Document Phase, the completed document, with all relevant yellow columns completed, shall be provided to CMMS Administration for review and approval.

4.1.6. CMMS Administration will create all assets and asset bundles in the CMMS prior to the pre-construction meeting.

4.1.7. Within one week after the pre-construction meeting, the Construction Inspector must provide contact information, including name and email, for all users that need access to the CMMS for data entry.

4.1.7.1. Any changes to access, new personnel, etc. shall be notified to Project Manager who will notify CMMS Administration.

4.2. **Construction Phase**

4.2.1. Throughout the Construction phase, as assets are installed, the Construction Inspector will be responsible for reviewing each tab and completing all applicable columns with green headers for the various asset types being installed on the project.

4.2.2. Each asset installed shall include a photo of the installed asset and of the associated nameplate.

4.2.3. Standard fields that are on most assets include

4.2.3.1. Manufacturer - The company or entity that built the asset.

4.2.3.2. Model Number - Identifying name or number for the line or asset

4.2.3.3. Serial Number - Identifying number unique to the specific asset

4.2.3.4. Catalog / Spec # - Unique specification number that can be used to order a replacement asset with the same specifications.

4.2.3.5. Installed Year - Year the asset was installed.

4.2.3.6. List Cost - Cost of each unit/system

4.2.4. Other columns are specific to certain asset types.

4.2.4.1. Examples are GPM and Total Dynamic Head on a Pump or Voltage on an electrical asset.

4.2.5. At any time, CMMS Admin may do quality control checks on spreadsheet progress and request changes or additional information.

4.2.6. All information shall be entered into the spreadsheet and the CMMS by the Construction Inspector prior to conditional acceptance.

4.2.6.1. Conditional acceptance will not be initiated until the data entry has been completed in the CMMS and verified by CMMS Administration.

4.3. **Project Completion**

4.3.1. At conditional acceptance of the project / portions of the project, Anne Arundel County CMMS Administration personnel are responsible for filling out the blue columns for each asset.

5. REFERENCES

5.1. Anne Arundel County Design Manual

5.2. DPW Asset Management Plan - Initiative DPW-2 Develop Asset Data Framework

5.3. DPW Asset Management Plan - Initiative DPW-3 Improve Contractor Asset Handover Process

6. EFFECTIVE DATE

6.1. 3/2/2022

Asset Classes	**Guidelines**	**Associated Assets**
Actuator	Higher Valves, Slide/Sluice/Weir Gates	
Aerators	Static tray type aerators, cascade, floating aerators, etc.	If mechanical aerator, create a motor and drive asset for each.
Air Compressor	All	
Air Conditioning	Where critical for Operation	
Air Diffuser	1 asset per tank\ditch	
Air Dryer	Refrigerant Or Desecant 75 Cfm Or Higher	
Air Handler	All	
Analyzers	Samples Or Sample Streams Sludge, Liquid Or Gas.	Create an asset for each associated probe for each
Bar Screen	All	Create an associated motor and drive for each
Belt Press	All	pack asset for each
Bio Filters	All	
Blower	All	Create an associated motor asset
Boiler	For hot **water** or **steam** heating systems (HVAC)	
Breaker	800 Amps Or Higher	
Carbon Absorber Units	Odor Control Devices	
Cathodic Protection	Impressed current type	
Chiller	All HVAC Chillers	
Clarifiers	thickening	Create an associated motor and drive for each.
Collector	Sludge Cross Collectors (Chain and Flight)	Create an associated motor and drive for each.
Comminutor/Grinders	Grinders, Shredders, Comminutors for sludge solids	power pack asset for each
Compactor	All (screw or hydraulic)	Create an associated motor and drive for each.
Conveyor	All, / Screw / Belt	Create an associated motor and drive for each.
Dehumidifier	Permanently Mounted Industrial-Type Units	
Diesel Pump	Portable Pumps, Emergency Diesel pumps at SPS'	
Drive	Gearboxes, All	See guidelines on the parent asset
Dust Collector	Baghouse dust collectors	
Electric Meter	BGE Utility meter	
Elevator	All	
Eliminator	Mist/Grease, Fan intake Eliminators for odor control	
Fan	Facility / room ventalation	Create an associated motor for each.
Feeder	All (dry chemical, lime, etc.)	Create an associated motor and drive for each.
Filter System	Gravity Filters, Membranes, Etc.	
Flame Arrestor	stopping the flames	
Floats	No data	
Flow Meter	All	
Fuel Tank	Stand-Alone Fuel Tanks	
Furnace	Gas/oil furnace for directly heating **air** in HVAC systems	
Garage Doors	Roll-ups, motorized	
Gas Detector	All	
Gate	Facility Entrance Gates. Motorized Only	
Generator	All	
Grit Bridge	Schrieber Process-type	Create an associated motor and drive for each.
Grit Classifier	All	Create an associated motor and drive for each.
Harmonic Filter	All	
Heater	200 Btu Or Higher	
HMI	Panel-mounted PC that runs the plant's process control	
Hoist	All, Monorail, Crane, Etc	
Hydrocyclones	All	Create an associated motor asset
Leak Detector	Fuel Tank Dual Wall	
Load Bank	Standalone Load bank Testing units	
Mag. Starter	All Magnetic motor starters	
MCC	Motor Control Centersl	
Mixer	All, Mixers, Flocculator, Mechanical Aerators	If Extended shaft type, create an associated motor and drive for each.
Motor	All	See guidelines on the parent asset
OIT	hardware with a screen (monitor) not covered under plant	
PLC	All	
Polyblend	Polymer blending unit	
Power Pack	Sludge Dewatering Presses, etc.	
Probes	concentration of samples. Examples (Dissolved Oxygen,	
Pump	All	
Radiator	Stand-alone, fan-cooled units for large generators only	
Recorder	Chart Recorders, Analog/Digital	
Rotary Press	Rotating perforated disc type sludge dewatering press	Create all associated motor and drive for each.
RTU	SCADA Remote Terminal Unit	
Heated Safety Showers	Safety showers with temperature regulation	
Fire Protection Systems	panels, etc at a facility.	
Sampler	All	
Scale	All, including Truck Scale	
Scrubber	Scrubber Towers, Odor Control	
Sensor	temperature, weight, or other physical properties.	

Sewer Pump Station	Asset to represent the entire station. This asset tracks items like Address, Service Area, GPM, Feet of Head, Stream etc.	
Server	SCADA Servers only	
Soft Starters	All	
Strainer	Greater Than 2"	
Sump Pump		
Switchgear	Greater Than 480v And Not Part Of A Different Asset.	
Tank	Chemical Storage Tanks	
Transfer Switch	Automatic / Manual Transfer Switches	
Transformer	MCC Feeders greater than 5 kva	
UPS	PLC Backup Only	
UV Modules	UV disinfection banks	
Valve	All 4" or larger or motorized	If Motorized, create an actuator asset for each
VFD	All	
Vibrator	All Vibrators / Bin Activator devices	

Check if Replacement in Kind	TYPE	EQUIPMENT TAG	PROCESS	LOCATION	DESCRIPTION	MCC ID / PANEL NAME	SPEC SECTION
PDE RESPONSIBILITY (COLUMNS A-I)							
Column A:	Check box if equipment installed is a replacement in Kind. If left blank it is considered to be New Equipment.						
Column B:	Type: Provide equipment type.						
Column C:	EQUIPMENT TAG: Provide equipment tag from **Drawings**. DO NOT Create equipment tag**, leave blank if no equipment tag is in Drawings.**						
Column D:	PROCESS: Used to identify the process, system or assembly when further clarification is needed. Note: The EQUIPMENT TAG from the main assembly can be used to clarify which specific unit the asset is associated with.						
Column E:	Location: Describe where this equipment is located. This may be a building, area, level, etc,						
Column F:	Provide description of asset. Include the parent asset name if part of an assembly or grouping. Ex Check Valve, Raw Sewage Pump 1						
Column G:	For electrical and instrumentation, mention which MCC or Panel if applicable						
Column H:	Spec Section: Note which section of the County Spec the asset can be found						

PROCESS	LOCATION	DESCRIPTION	INSTALLED YEAR	LIST COST	MAINTENANCE STRATEGY	SERVICE AREA	WARRANTY START DATE / ACCEPTANCE DATE	WARRANTY END DATE
Design Engineer / Design Phase Responsbility - Yellow			**Contractor Responsibility - Green**		**Central Maintenance Responsibility - Blue**			
Emergency Power Generation	Generator Area	Radiator, Generator 1 cooling						
Emergency Power Generation								
Emergency Power Generation								
Emergency Power Generation								
Emergency Power Generation								
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