4.19 SANITARY SEWER LIFT STATIONS AND FORCE MAINS

A. All lift stations with capacities at 2,000 gallons per day (gpd) or greater are subject to Colorado Department of Health and Environment (CDPHE) Regulation 22.

B. Cost Responsibilities

1. Design and Construction

a. The Developer shall be solely responsible for all costs associated with the design and construction of the lift station and force mains. This includes the cost of any easements, land acquisition, documents associated with permitting approval through CDPHE and North Front Range Water Quality Association (NFRWQPA), and any other cost associated with the project.

2. Reimbursement

a. Where additional service area outside of the proposed development is anticipated, the City of Greeley will require the lift station and associated improvements to provide additional capacity than what is necessary for the initial development. Refer to Section 2.12 of this criteria for additional clarification.

3. Operations and Maintenance

a. Public Facilities: Public lift stations are defined as any lift station serving more than one user and accepted by the Public utility. Operations and maintenance activities shall be the responsibility of the City for all public lift stations only upon completion and acceptance of the proposed improvements. The Developer shall provide an operations and maintenance manuals and procedures for all equipment and processes associated with the lift station. The Developer shall coordinate with the City during the planning and design phases on equipment operations and maintenance requirements.

b. Private Facilities: Private lift stations are defined as any lift station serving only one user. Operations and maintenance responsibilities for private lift stations are the sole responsibility of the owner or private entity.

C. Planning and Permitting

1. General

a. Gravity based solutions are preferred to lift stations as it provides the most reliable and lowest cost service for our customers. The use of a lift station and force main shall be evaluated on a case by case basis. If there is an appropriate gravity solution then the developer shall design and construct the proposed improvements meeting the City of Greeley Criteria. Any lift station or force main shall first be approved by the City following proper justification by the Developer. Where a lift station is determined to be required it shall be designed to allow for an eventual connection into a gravity system.

b. The lift station and force main design shall adhere to state and regional approval processes and the Developer shall keep informed and notify the City of major milestones during the

design and approval processes. The Developer shall adhere to the submittal requirements previously stated in Section 2 of these Criteria.

2. Procedures

   a. The Developer shall employ the services of an engineer licensed in Colorado that has successfully designed and permitted at least two lift stations of similar size as proposed, within the State of Colorado. The Developer and the engineer shall adhere to the following procedures through the planning and design phases:

      i. Coordinate a conceptual project meeting with the City to provide justification for the project and initial design considerations including site location, force main alignments, land acquisition requirements, preliminary design criteria, project schedule, and permitting requirements.

      ii. Upon initial conceptual acceptance for consideration of the need for a lift station, provide written project justification for the project and design considerations including site location, force main alignments, land acquisition requirements, preliminary design criteria, project schedule, and permitting requirements

      iii. Attend follow up meeting following completion of the review of conceptual documents

      iv. It is the expectation that the developer keep the City informed of the project's progress from design through construction approval. This includes notifying the City of the major project milestones associated NFRWQPA and CDPHE review and approval process and allowing for City review of major reports and documents. Major milestones include but are not limited to:
         - Site Application submittal to NFRWQPA
         - Signed and approved Site Application submitted to CDPHE
         - Basis of Design Report (BDR) submittal to CDPHE
         - Design approval from CDPHE
         - Funding requests
         - Public meetings/outreach

      v. Upon the City's review and acceptance of the conceptual design, the applicant may proceed with the Lift Station Site Application process in accordance with CDPHE Regulation 22.
         - The Site Application shall be submitted to NFRWQPA following review and acceptance by the City
         - Following NFRWQPA and local agencies approval of the Site Application, the applicant shall submit the Site Application and required counterparts in accordance with Regulation 22 to CDPHE for review and approval

      vi. The Lift Station BDR shall be reviewed by the City prior to submitting the BDR to CDPHE for review and approval. The BDR shall include a 60 percent design package and shall only be submitted to CDPHE upon City approval of 60 percent design package

      vii. Prepare and deliver final design plans and technical specifications for the City's review and approval.

      viii. Applicant shall coordinate with the City through the construction bidding process as necessary.

ix. Applicant shall coordinate construction inspections with City Inspectors.

x. Applicant shall submit all construction submittals for review including shop drawings and data and operation and maintenance manuals

xi. Applicant shall coordinate with the City for start-up testing and required training

xii. Applicant shall submit final record drawings to the City in AutoCAD and pdf format

3. Colorado Department of Public Health and Environment (CDPHE)

   a. The design and construction of all lift stations and force mains shall adhere to CDPHE's most recent version of Regulation 22 – Site Location and Design Approval for Domestic Wastewater Treatment Works (The City reserves the right to review all procedures and reports required under Regulation 22 and request revision if necessary. Where CDPHE's Regulation 22 and the City's Criteria differ, the more restrictive of the conditions shall apply.

4. North Front Range Water Quality Planning Association (NFRWQPA)

   a. The planning and Site Application process of the proposed lift station and force main shall be in accordance with NFRWQA wastewater utility plan guidance. The applicant will be required to provide updates to the City's Wastewater Utility Plan (WUP) for the proposed lift station and force main as part of the Site Application process.

   b. The process for obtaining lift station approval from the Water Quality Control Division (WQCD) begins with the NFRWQPA (www.nfrwqpa.org). CHPHE *Regulation 22*, latest revision, requires that prior to WQCD final design review and approval, the lift station Site Application must be submitted to the NFRWQPA. Refer to the NFRWQPA website and *Regulation 22* for guidelines and requirements on the lift station site location and design approval process.

5. City of Greeley

   a. The Developer shall coordinate with the following City's departments to ensure all procedures and policies are adhered to.

      i. Water and Sewer Department

      ii. Community Development

         ii-a. Engineering Development Review

         ii-b. Planning Department

         ii-c. Building Inspections

      iii. Other Departments as Required

6. Lift Station Design Criteria

   a. Applicable Codes, Environmental Compliance, and Health and Safety

      i. Applicable Codes: For work done in the City, work shall be performed in accordance to the codes established by the City's building department.

ii. Environmental Compliance: Environmental assessments and/or environmental reviews may be required as a preliminary investigation to determine if a particular parcel of real property is subject to recognized environmental constraints such as, and not limited to the following: floodplain areas, wetlands, endangered species, and hazardous conditions. Should environmental constraints as identified above, it is the Developer's responsibility to incorporate mitigation measures to comply with environmental requirements in accordance with applicable and current rules and regulations.

iii. Health and Safety: Public lift stations are required to conform to all City and OSHA health and safety requirements. City operation staff safety shall also be considered during the design and construction of the lift station including, but not limited to:

- Readily accessible equipment placement for maintenance activities
- Classified areas in accordance with the National Fire Protection Association (NFPA) 820 Regulations
- Lifting assistance for heavy equipment
- Nonslip floor finishes
- Handrails
- First-aid and safety equipment
- Fall protection
- Limitation of confined spaces – it is desired by the City to limit confined space entries where possible

b. Determination of Wastewater Flows

i. Existing wastewater flows shall be calculated using the calculation methods stated in Section 4.03, 4.04, and 4.05. Should the project area not fit the previously stated design flow estimation methods, applicable and industry-standard calculation methods shall be utilized. Methods include real-time flow monitoring or calculations based on land-use. Methods and calculations shall be included in relevant planning documents and subject to City's review.

ii. Proposed and future wastewater flow projections shall be estimated for the build-out conditions of the service area. Estimation methods shall be based on projected land-use. The planning period and projected land-use within the service area shall be coordinated with the City during the planning phases.

iii. Organic and other applicable wastewater constituent loadings shall be considered and evaluated based on existing and projected land-use. It is the Developer's responsibility to calculate based on most current available information, flows and constituent loadings for accessing available sewer and wastewater treatment capacities.

c. Impacts on Downstream Lift Stations or Sewer Capacities

i. Ultimate peak hour design flows shall be used to determine the impact to downstream collection system infrastructure including treatment facilities, lift stations, and sewers. Existing infrastructure needs to be able to accommodate peak flows and loadings from new lift stations and force mains. The capacity of existing infrastructure to accommodate flows from new lift stations shall be justified to the City as part of the planning and design documents.

d. Lift Station Capacity

i. Lift station capacity shall be designed to accommodate existing and future projected peak flows for the entire service area.

ii. Hydraulic calculations and system/pump curves require consideration and shall be submitted for review during the planning phases to the City of Greeley and as part of the CDPHE's approval process.

iii. Receiving sewers shall be evaluated to ensure adequate capacity to accommodate the ultimate lift station flow.

e. Emergency Storage

i. The lift station shall be designed for at least 60 minutes of emergency storage at peak hour flow conditions or as required by CDPHE. Emergency storage can utilize volume within the wet well above the high level alarm and upstream collection system piping provided that it is demonstrated that back-up will not occur into any existing or potential future service connections or taps. No future taps shall be constructed within the section of influent sewer or sewers to the lift station designated to provide emergency storage. If a piping connection is required to accommodate emergency storage provisions, the invert of the pipe connecting the wet well to emergency storage shall be above the high level alarm. Additional emergency storage may be required at the discretion of the City based on site location, emergency response time, and potential environmental concerns.

ii. Emergency storage can be accomplished using an additional pre-cast concrete manhole or storage vault like structure. The emergency storage structures shall provide adequate access and floor slope for cleaning and shall be designed with pre-cast concrete, cast-in-place concrete or fiberglass reinforced plastic. If constructed of concrete, adequate protection (i.e. protective coatings) shall be provided to mitigate corrosion caused by hydrogen sulfide. If used, the emergency storage vault shall be designed to provide flow to and from the wet well to the vault and with adequate access for pumping via vacuum truck or other appropriate method.

iii. If emergency storage can be accomplished through gravity flow from the lift station to another existing collection system, the City may consider that as an option to meet emergency storage requirements. It shall be demonstrated that the gravity overflow, existing collection system, and downstream facilities be adequately sized to accept increased flow. Additionally, should the collection system be operated by another entity, a legal agreement stating the entity can and shall receive emergency flows shall be coordinated and presented to the City during the design review process.

7. Force Main Design Criteria

a. Materials and Sizing

i. Force main material shall be AWWA C900-16 with minimum wall thickness of at least DR-25. DR-18 or DR-14 shall be required if pressure or surface loading at any location in the system exceeds the DR-25 pressure rating.

ii. Force mains shall be minimum 4-inch diameter. Force mains shall be sized appropriately for a minimum fluid velocity of 2 feet per second and maximum velocity of 7.5 feet per second. Sizing shall also conform to CDPHE design requirements, whichever is most limiting. Parallel force mains are strongly preferred

by the City for maintenance procedures, emergency conditions, and capacity optimization between existing and build-out flows. If parallel force mains are not considered feasible for a specific installation, it shall be demonstrated that the force main diameter is optimal for existing and build-out flow velocities.

iii. If force main diameter is such that the wastewater velocity is less than 2 feet per second at initial operating conditions, the design shall include VFDs on the pumps to allow the motors for the pump or pumps to increase frequency to increase the wastewater velocity in the force main to be a minimum of 3 feet per second for a minimum flushing time of 5 minutes. Reference the Electrical and Controls section of this criteria.

b. Access / Cleaning Stations

i. Force main clean-out access shall be provided every 500-feet in situations where the force main is 950-feet or longer. Clean-outs shall provide adequate access to allow for pipeline condition observations via video camera.

c. Protection, Bedding and Compaction

i. Pipe bedding and backfill of force mains shall conform to the specifications in Section 02315 of these standards.

d. Force Main Alignments and Separation

i. The minimum buried depth of the force main shall be 60-inches from top of pipe.

ii. Wastewater force mains shall adhere to CDPHE and City standards for separation between potable water lines and other utilities. Wastewater force mains shall travel below existing potable water lines meeting the minimum requirements as outlined in Section 4.18. Should minimum separation requirements not be possible, refer to encasement requirements in Section 4.15 of the Criteria.

iii. Should the wastewater force main alignment be such that it cannot accommodate these separation requirements vertically or horizontally, provisions shall be provided to safeguard the existing utilities in accordance with the City design criteria and construction standards.

e. Special Permitting Requirements

i. In situations where the force main alignment crosses areas that include wetlands, floodplains, irrigation ditches, railroads, and waterways. The Developer shall be responsible for all permitting during the design phase to ensure that local and state requirements are adhered to. The Developer shall document all required permits with the City prior to proceeding with construction. In all cases, the Developer shall evaluate alternative force main alignments to minimize impact to sensitive areas described herein.

ii. Easements required for the force main alignment shall adhere to Section 2.06 of these criteria. All easements required for the force main shall be approved by the City and granted to the City prior to City of Greeley approval of construction documents.

8. Land Acquisition and Easements

    a. All land area requests for the lift station sites shall be submitted and approved by the City prior to starting the land acquisition process. Lift Stations shall be located on property deeded to the City. The minimum size for the lift station site shall allow for adequate equipment access, maintenance activities, and ancillary equipment (i.e. generator, odor control, emergency storage, etc.). In no cases shall the lift station site be less than 2,500 square feet in size. Applicant shall provide preliminary lift station site drawings showing major lift station components, security, buildings, and access for the City to review and determine required site size.

    b. Force main alignments exiting the lift station site up to the point of gravity connection shall be contained within an exclusive sewer easements and shall be dedicated to the City per Section 2.06 of this criteria.

D. Lift Station Site

1. Location and Topography

    a. The lift station and site location shall be designed and constructed to limit disturbance to the surrounding properties both aesthetically and during construction activities. The site shall allow adequate access to the site from existing public right of way. The lift station site shall be designed to provide adequate drainage away from the lift station and building and conform to City standards for drainage and storm water management plans. Developer shall perform a geotechnical evaluation of the site to determine soil conditions and hydrology as well as recommendations for lift station construction. Lift station sites shall be located outside of the FEMA 100-year floodplain with the finished floor elevation of the lift station a minimum of 2-feet above the floodplain. All lift station site locations are subject to review and approval by the City and CDPHE Regulation 22.

2. Lift Station Building / Enclosure

    a. The lift station shall be enclosed in a weather proof structure. The lift station enclosure and lift station pumping components as a minimum shall be accessible without permitting for confined space access. As a minimum the lift station enclosure shall be ventilated and heated and conform meet the City's planning and building department requirements and applicable structural and building codes. The size of the building or enclosure shall allow for adequate clearance to maintain pumping equipment, piping, valves, electrical gear and controls. The minimum spacing between pumps shall be 30 inches and spacing around pumps and electrical panel clearance shall be 36 inches. Building or enclosure entry ways, hatches and overhead door shall allow for convenient access and equipment removal for maintenance and replacement. All lift station enclosures or buildings must be approved by the City and applicable architectural committees that are associated with the subdivision or local association.

3. Aesthetics

    a. The lift station shall be subject to the City's Development Review process and applicable development standards. The lift station architecture and aesthetics shall be designed to match the surrounding structures. Landscaping shall be considered on the perimeter outside

of the fence and planned to match the surrounding environment. Appropriate screening and other methods shall be utilized to minimize noise and visual impacts.

4. Access

    a. All wastewater lift stations shall be sited to allow access by all-weather surface roads capable of accommodating maintenance trucks from public right of way to the lift station site. The access shall at a minimum support HS-20 loading with a minimum width of 15 feet. The access points and site shall be designed to allow WB-50 trucks to maneuver within the site and exit the site without backing into public right of way. The site layout shall allow for access to the wet well and vacuum/jetter truck to clean out accumulated material in the wet well. All paved surfaces shall be designed for the expected vehicle and equipment loads.

5. Security Fencing

    a. The lift station site shall contain perimeter security fencing minimum 6' in height. The fencing is subject to the City of Greeley Municipal Code and shall be reviewed and approved by the City.

    b. The lift station site access gate shall have a minimum size full width opening of 18-feet and of lockable type.

6. Lighting

    a. Lighting shall be provided at the lift station site to allow for necessary activities during night and times of low visibility. The lighting system shall be designed to provide illumination best suited for the station layout with may include suspended, wall, or ceiling mounted fixtures and shall be suitable for routine maintenance activities and inspections. Site lighting equipped with photocells shall not be allowed. Refer to Chapter 18 of Greeley Municipal Code for more information, as applicable.

7. Potable Water

    a. The site shall have access to potable water. Potable water connection, service size, backflow device and meter shall be coordinated with the City. At a minimum, there shall be frost proof yard hydrant located in the vicinity of the wet well.

E. Lift Station Components

1. Pumping System

    a. Each Lift Station shall have a minimum of 2 pumps. The pumps shall be designed to accommodate existing flows and future flows from fully developed contributing area. Firm capacity of the pump system shall be designed (or phased) to pump ultimate peak flow at maximum computed total dynamic head. Pump operation shall be automatic but fitted with the capability to run the system in manual control.

    b. Lift Stations shall be designed as a duplex system as a minimum. Duplex system for ultimate flow of the service area, shall be designed so that each pump is sized for peak hourly flow. The applicant shall provide a spare pump of the same capacity. Lift stations serving service areas that are phased over several years shall be designed initially as a duplex system as a minimum with room to add additional pumps for meeting the ultimate flow demands of the service area. Lift stations that are designed with more than two pumps

shall be capable of pumping peak hourly flows with the largest pump out of service. The applicant shall provide a spare pump matching the size of the largest pump in service.

c. In all cases pumping systems shall be designed to accommodate existing and build-out flows with adequate redundancy as defined by CDPHE Regulation 22 and in these criteria. If future build-out conditions require pumps (greater than 2) that not needed for near term flow conditions, the lift station shall be designed to add additional pumps, piping, valves, electrical and control without the need for a major system shutdown and / or bypass pumping.

d. Pumping system shall be designed to allow for adequate access between other pumps, piping, and ancillary equipment for maintenance activities including, but not limited to, routine maintenance and inspection and pump removal.

e. Required Pumping System Type: Above Ground Mounted Self-priming Suction

The pumping system is self-priming suction pumps placed on grade with minimal piping to suction from the wet well. The only accepted manufacturer for the pumping system is Gorman Rupp. Pumping systems shall be site-specific designs or pre-packaged systems meeting site requirements. All designs are contingent upon review and approval by the City.

f. Alternate Pumping System

If the Developer with approval from the City, determines above ground mounted self-priming suction pumps are insufficient for the application, the Developer can seek a variance to utilize either wet well / dry well or submersible pump configurations. The Developer must adequately prove that the alternative pump configuration is the optimal choice for the application and include evaluations between both dry-pit and submersible configurations.

1. Submersible Pumps: Where above ground mounted self-priming suction pumps are insufficient, City of Greeley will only consider submersible pumps where the ultimate build out peak hour flow rate is less than 100 gallons per minute. Where submersible pumps are approved by City of Greeley, the pumps must be removable without entering the wet well by providing rail and crane system. Control Panels and associated equipment shall be located within an enclosure of adequate size. The Developer shall provide two spare pumps to the City of Greeley.

2. Wet Well/Dry Well: Where above ground skid mounted self-priming suction pumps are insufficient and flow rate is greater than 100 gallons per minute during peak hour flow at full build out, the lift station shall be configured to provide separate wet wells and dry wells. Common walls between wet wells and dry wells shall be water and gas tight. Suitable and safe means of access shall be provided to the dry well for operations staff, maintenance, and removal of all equipment from the dry well. Access shall include separate equipment and access hatches. Access to the dry well shall be provided through stairs. Ladder access is not allowed. Where dry wells are considered, the lift station shall be designed to ensure that surface runoff cannot enter the lift station. Where groundwater may be exist above the dry well, adequate measures shall be provided to prevent infiltration of groundwater into the dry well and wet well.

g. Pumping System Components

i. Each pump shall have a dedicated check valve, plug valve, and air-relief valve on the discharge side of the pump. Pressure gauges shall be provided on both the suction and discharge (prior to the check valve) side of the pump. Pressure gauges shall be provided with a pulsation snubber constructed of 316 stainless steel and an isolation valve. It is preferred that these pump system components are supplied by the pump manufacturer if supplied as a skid-type system to ensure compatibility, performance and single point of supply.

h. Hydraulics

i. Pumps shall be designed to accommodate existing and future flows. Pump design calculations shall be included in the design reports and subject to City review. Hydraulic calculations shall include pipe friction losses using appropriate friction coefficients and minor friction losses. Net positive suction head available ($NPSH_A$) and net positive suction head required ($NPSH_R$) shall be considered to ensure pump cavitation will not occur. Control descriptions for the pumps shall consider water levels required to maintain adequate $NPSH_A$ and $NPSH_R$.

2. Station Piping

a. Material and sizing

i. Station piping shall be ductile iron and sized to accommodate the necessary flow ranges. Flanged header pipe shall be ductile iron complying with ANSI/AWWA A21.51/C115 and Class 53 thickness. Flanges shall be ductile iron class 125, or as required by pumping application and pressures, and comply with ANSI B16.1, Generally, the liquid velocity in the station piping shall be no less than 3 feet per second and no greater than 10 feet per second.

b. Expansion Joints/Victaulic Coupling

i. Station piping shall include expansion joints, flanged coupling adaptors and/or grooved couplings to allow for dismantling of station piping for maintenance and parts replacement.

3. Valves

a. Plug Valves

i. Isolation valves shall be eccentric non-lubricated plug valves. Each pump discharge shall have a dedicated isolation valve so that each pump can be isolated from the common discharge header. Plug valves shall be of cast iron body, ASTM A126 Class B. Valve plugs shall be cast iron ASTM A126 Class B covered with a Buna-N Rubber compound. The seats are to be a corrosion resistant alloy either 316 stainless steel or nickel. Valve body shall be semi steel with flanged end connections drilled to 125 pound, or higher as required by application pressures, standard. Valve shall be operated with a single lever actuator providing lift, turn, and reseat action. The lever shall be equipped with a locking device to hold the plug in the desired position. Valves shall be able to pass a spherical solids not less than 3 inches diameter. Accepted manufacturers include DeZurik, Valvmatic, Milliken.

b. Check Valves (4” or more in diameter)

i. Check valves shall be swing check valves capable of passing a 3-inch spherical solid. Check valves shall meet the latest AWWA C508 standard and be of the resilient hinge check valve type. All internal hardware shall be stainless steel. Valve shall be equipped with flanged ends and be fitted with an external lever and spring. Valves shall be equipped with removable cover plate to permit entry or for complete removal of internal components without removing the valve from the line. Valve shall be rated at 175 PSI water working pressure, 350 PSI hydrostatic test pressure. For high pumping head applications (150 feet or greater), the Developer shall submit a type of check valve that will minimize hydraulic surges and slam to the system. Each pump discharge shall have a dedicated check valve. Accepted manufacturers include Valmatic, DeZurik, Victaulic, Golden Anderson.

c. Combination Air and Vacuum Valves

i. Sewage rated combination air and vacuum valves shall be placed at the discharge of pumps as close to the +check valve as possible and at any local high points in the station piping. Accepted manufacturers include Valvmatic and Golden Anderson.

4. Bypass Pumping Assembly

a. Lift Station Out of Service

i. A bypass pumping configuration shall be designed to bypass the lift station should it ever need to be taken offline. The bypass pumping configuration shall include provisions to bypass the entire lift station as well as lift station components including the wet well and pumping equipment and station piping. Bypass connections shall also be included on the common discharge header to the lift station pumps (station piping) as well as the force main (site piping) along with isolation valves. All bypass connections shall be at a minimum 6” camlock.

b. Approach Manhole

i. An approach manhole shall be constructed upstream of the wet well within the lift station site boundaries. The approach manhole shall serve as a common connection for the gravity sewer or sewers feeding the pump station and shall connect to the wet well by a single gravity pipe.

c. Corrosion Protection and Coatings

i. Wet well

Lift Station wet wells shall have corrosion protection on the interior surfaces to prevent damage to the wet well caused by concentrated levels of H2S and other corrosive properties of raw wastewater. Economic and life cycle analysis shall be performed on various corrosion protection methods including polymer concrete, waterproofing/microbicide admixtures, and epoxy coatings. Determination of the most suitable corrosion protection method is subject to City approval based on the economic and life cycle analysis.

All wet well penetrations shall be link sealed and grouted to inhibit any leakage from the wet well or groundwater infiltration.

d. Coatings and Paintings

All exposed carbon steel surfaces, piping and equipment shall have field-applied protective painting or coating except where material (i.e. PVC, stainless steel, hot-dipped galvanized or aluminum) or factory coating warrants exception. All paint and coatings systems shall be approved by the City and shall adhere to City standards for color coding.

5. Electrical and Controls

a. Electrical Equipment

i. All electrical equipment shall be in accordance with the latest standards of NEC and, where applicable, meets all requirements for hazardous locations in accordance with NFPA 820. Developer shall coordinate with City Building Department on applicable codes.

ii. Developer shall coordinate with the City for electrical utility providing electrical service. Station shall be provided with a separate utility transformer and meter/main with ground fault protection. Primary power to the station shall be 480 volt, 60 Hz, 3-phase service per utility provider standards. Developer is required to pay permitting, design and costs for primary power to the lift station site. Secondary power service shall be designed by a certified electrical engineer licensed in the State of Colorado. As a minimum, the station shall include service disconnect panel, automatic transfer switch (ATS), motor control center (MCC) or electrical distribution panel. The service disconnect panel shall be mounted on the exterior face of the lift station building common wall to the indoor electrical switch gear.

iii. The ATS shall be provided to switch from normal utility power to standby emergency power upon power outage and switch back to normal power once the power outage is restored. The ATS shall have indicating lights for normal power, emergency power, and a digital panel indicating volts and amps. The ATS shall be mounted inside the lift station building integral to the MCC. The ATS manufacturer shall be compatible and approved by the accepted lift station pump manufacturer, Gorman Rupp. The City's standard for standby emergency power is natural gas-powered engine generators manufactured and provided with the lift station pumps manufacturer, Gorman Rupp. If the lift station pumps are provided by a manufacturer other than Gorman Rupp, the Developer shall provide the ATS and standby emergency power generator specifications and manufacturer for City review and approval.

iv. Electrical switchgear (480 volt) shall be mounted in a NEMA 1 MCC with removable buckets within a NEMA 3R wrapper. A step-down transformer shall be included to provide power service to a separate light or power panel rated for 120 / 240 volt service. The light or power panel is required to provide service for interior and exterior lighting, receptacles, ventilation and controls. Switchgear shall be manufactured by Cutler-Hammer, Allen Bradley, Square "D", or approved equal by the City.

v. Transient voltage suppression rated at 80 KA minimum shall be provided at the main electrical service panel and shall be installed in accordance with the latest requirements of NEC Article 285

b. VFDs and Soft Start and Stop

i. All motor sizes greater than 20 HP shall be equipped with a reduced voltage solid state start and stop or also known as soft start and stop. The use of variable frequency drives (VFD) for the lift station pumps shall be evaluated on a case by case basis. The Developer will be required to demonstrate the advantages for installing VFDs for the ranges of pumped flows. The soft start / stop device and / or VFD shall be mounted adjacent to the MCC. Accepted manufacturers for the soft start / stop and VFD equipment shall be Allen-Bradley, Cutler-Hammer, Toshiba.

c. Level Controls

i. The primary level control system used for the lift station to turn pumps on and off and sequence lead and lag operations shall consist of the radar level measurement type. The primary level control system shall have a minimum of five differential level set points including low liquid level, start / stop lead pump, start / stop lag pump, start / stop standby pump (if required), and high water level. The level control shall be equipped with a transmitter device and user interface screen for user set points and display of liquid level in the wet well. Contacts shall be provided for selected alarm outputs for integrating into the SCADA and telemetry system. Accepted manufactures for level control shall be Endress Hauser or a manufacturer approved by the City.

ii. In addition to the primary level control system, the lift station shall be equipped with a secondary level control system for back-up. The secondary level control shall consist of electro-mechanical float switches for low water cut-off, pump on / off, and high water alarm. Accepted manufacturers for float switches shall be Siemens Water Technologies Model 9G-EF or approved equal

d. Lift Station Control Systems

i. Controls shall provide automatic reset of alarm conditions for normal power fail, high water level, standby pump run, and a common alarm contact. However, alarm conditions shall activate an alarm light that is mounted at the roof line of the lift station building or enclosure. The alarm light shall require a manual reset. Each pump shall be provided with alarm lights and pump shutdown for pump motor high temperature, pump moisture detection, and pump overload fail conditions. Any pump alarm conditions shall require manual reset. All lift station alarm outputs shall be transmitted via telemetry system to on-call City operation staff and master SCADA control center.

ii. Elapsed time meters shall be supplied for each pump and shall consist of the six digit non-reset type. The elapsed time meters shall be connected to the each pump motor starter to indicate total running time for each pump in “hours” and “tenths of hours”. An integral pilot light shall be wired in parallel to indicate that the motor is energized and running.

iii. The lift station PLC shall be an Allen Bradley CompactLogix 5069-L320ER. Alternate PLC manufacturer’s must demonstrate compatibility with the City’s control logics platform. The PLC shall be equipped with a CPU with 1 MB of user memory, two Ethernet / IP communication ports and 1 USB port for firmware download and programming. The PLC control panel shall be sized to adequately contain all PLC and communication equipment and rated for NEMA 3R enclosure. The face of the control panel shall include a minimum size 10-inch color operator interface terminal (OIT)

for data entry and display. The OIT shall be Red Lion Graphite. Each PLC shall have a minimum of a 2-hour uninterrupted power supply (UPS). Each control panel shall contain adequate surge protective devices.

e. Flow Meters

i. Flow meters shall be of the electro-magnetic type and installed on the common discharge header downstream of the last pump discharge connection. The flow meter shall be fitted with grounding rings as required and 125 pound / 150 pound flanged connections. Flow meter shall include a wall mounted transmitter along with 4-20mA DC output. Flow meter shall be integrated and programmed with the supplied PLC for local and remote display for flow and totalizer. The flow meter shall be manufactured by Rosemont Model 8750W or accepted substitution.

f. Back-up Power Supply

i. Back-up power shall be supplied at the lift station to power the pumps and ancillary equipment in the event of a power outage. The back-up power system shall be natural gas powered. The Gorman Rupp standby engine system is preferred and the Developer shall determine if that system is suitable for the application. Other back-up power systems will be considered if application is not suitable for the Gorman Rupp system. If not provided by Gorman Rupp, alternate back-up power system will be evaluated and approved by the City on a case-by-case basis. The City's preference for alternate back-up power systems is Cummins for both the generator and ATS.

g. Telemetry and SCADA

i. The Remote Telemetry Unit (RTU) shall communicate by way of Modbus serial or Ethernet, or Allen Bradley Ethernet or serial. If there is no ability to communicate with the Control Panel, analog and digital Inputs may be utilized. Required Inputs: A: Wetwell Level, B: Flow, C: Flow totalization, D: Pump motor status, E: Soft Start status "Faulted", F: Power Fail, G: Pump Amperage, H: VFD Status, I: VFD speed, J: Station common alarm, K: Generator Running, L: Generator Switch in Normal or Emergency, M: Generator common alarm, N: Pump runtime, O: Pump starts, P: Control Panel Temperature, Q: Selector Switches Status, R:

h. H2S Monitoring Systems in Wet well or discharge manhole

i. The City may require that the Developer design and install H2S monitoring in the manhole the force main discharge into. Factors that may require H2S monitoring in the manhole include pump flow, force main length and location of the discharge manhole.

6. Mechanical

a. Ventilation

i. Adequate ventilation shall be designed in buildings and vaults as required and adhere to all applicable State, NFPA, and OSHA requirements. Ventilating system shall consist of natural gas make-up air units sized to provide minimum of 6 air changes per hour and shall automatically begin operation upon user selected indoor temperature settings for both summer and winter modes. Supplemental cooling and heating will be required if building temperatures exceed 85 degrees Fahrenheit (F) or fall below 55 degrees F. Ventilation shall be accomplished by the introduction of

fresh air in the station and be filtered to remove debris and minimize particles. Ventilation fans shall automatically come on upon entry of the lift station enclosure or building or activated by the light switch adjacent to the entry door. Heating

ii. In addition to the make-up air ventilation system supplemental heat shall be required using natural gas unit heaters to maintain a minimum temperature of 55 degrees F. Unit heaters shall be automatically controlled thermostatically. Heating systems shall be designed based on an outside ambient temperature of negative 20 degrees F.

b. Air Conditioning

i. Air conditioning shall be provided if ventilation system cannot ensure inside air temperate of below 85 degrees F within a reasonable time period of ventilating. Cooling systems shall be designed based on an outside ambient temperature of 105 degrees F.

c. Plumbing

i. Drains

Lift station enclosures or buildings shall contain no floor drains that connect to the wet well. The enclosure at the level the pumps are located shall include a trench drain which slopes to a sump pit equipped with a duplex submersible sump pump system controlled with weighted float level switches. The sump pump system shall discharge to the top of the wet well with an air gap. The pump system shall be sized based on expected drain flows such as air release valves, seal water, maintenance, etc. Each sump pump discharge shall contain a check valve and isolation valve along with a pump removal system. The sump pump system shall be connected to the back-up or emergency power system.

The lift station site shall be equipped with a perimeter drain if recommended from the geotechnical study.

7. Odor Control and H2S Generation

a. The lift station shall be evaluated for the odor mitigation system and final determination of implementing odor control measures will be reviewed and determined by the City. Supporting data, calculations, or assumptions for hydrogen sulfide generation based on estimated wastewater characteristics and industry standards shall be included in the evaluation. In the absence of supporting data and / or calculations, the Developer shall utilize the latest edition of "Metcalf and Eddy Wastewater Engineering Treatment and Resource Recovery" for medium strength sulfide concentrations in wastewater. Other factors to consider in the evaluation include but are not limited to:

- Proximity to and use of neighboring properties
- Composition of the wastewater (BOD5, COD, TSS, Sulfides, TKN, Ammonia-N)
- Wind direction and downwind properties
- Operation and maintenance requirements of odor control system

b. If odor control is determined necessary, the type of system shall be selected based on the site-specific needs of the lift station. All ancillary equipment and necessary provisions shall be incorporated into the design of the lift station to provide a functional system. Odor control systems may include but are not limited to the following mitigation technologies:

- Carbon absorption systems
- Biological scrubber or filter

- Chemical scrubber
- Calcium nitrate addition

c. If odor control is not required, provisions for future addition of odor control facilities (i.e. installation of ventilation ducts and penetration into the wet well for future connections) shall be provided.

8. Force Main Components

a. Connection to Existing Gravity Sewer

i. Force mains shall connect to a gravity wastewater system at a manhole or a structure designed to receive pumped wastewater. The manhole or structure shall be retrofitted with appropriate corrosion protection as described in Section F.5.A of these Criteria. In addition to the connecting manhole, the next two downstream manholes shall be protected in accordance with Section F.5.A of these Criteria. The force main discharge shall be designed to minimize turbulence and scour within the connecting structure. The City will determine on a case by case whether odor control is required at the receiving structure.

b. Valves

i. It is desired by the City to design the force main to limit required valves along the force main alignment. High points and low points shall be minimized along the pipe alignment.

c. Air and Vacuum Relief Valves

i. Air relief valves shall be provided on ultimate and local high points throughout the force main alignments. All air relief valves shall be located in an access manhole or vault appropriately sized for the application and maintenance staff access.

d. Non-return Valves

i. If required, isolation valves shall be swing check type. All non-return valves shall be located in an access manhole or vault appropriately sized for the application. Accepted manufacturers include DeZurik, Valvmatic, Milliken

e. Isolation Valves

i. If required, isolation valves shall be plug valve type. All direct buried plug valves shall normally remain open (with exception of bypass connection and isolation valves) and be installed with a valve box and lid. Accepted manufacturers include DeZurik, Valvmatic, Milliken

f. Corrosion Protection

i. A cathodic protection system shall be designed for any buried carbon steel or ductile iron piping and structures in the system.

9. Testing and Start-up

    a. Lift Stations

        i. The Developer shall develop a plan to test and demonstrate successful and flawless performance of all equipment and components of the lift station in manual and automatic mode. The start-up and testing plan shall be submitted to the City for review prior to commencing the start-up. A factory representative for the pumps and controls shall be on site for the start-up operations.

    b. Force Mains

        i. Force mains shall undergo hydrostatic pressure testing for at least two hours at two times the working pressure. Test results shall be documented and demonstrate holding pressure within the criteria and specifications described in the City's Design Criteria and Construction Specifications (see Section 01713 Water Distribution System Testing for requirements).

10. Operation and Maintenance Procedures and Warranties

    a. Operations and Maintenance

        i. The Developer shall supply the Water and Sewer Department with two (2) complete sets of operation and maintenance instructions, shop drawings, and pump curves. An electronic set on a thumb drive shall also be submitted. Developer and/or manufacturer shall provide one half day training on operations of the lift station for City Staff

        ii. Operation and maintenance instructions shall be specific to the equipment installed. All non-relevant reference material shall be removed or clearly crossed out using heavy red line.

        iii. All emergency power generation equipment shall have operation and maintenance instructions.

    b. Warranties

        i. A two (2) year warranty shall be provided for the lift station system including performance, materials, and installation.

        ii. The date of substantial completion shall be specifically determined, in writing, for the lift station system.

        iii. Any warranties associated with the lift station shall be transferred to the City after construction is complete.

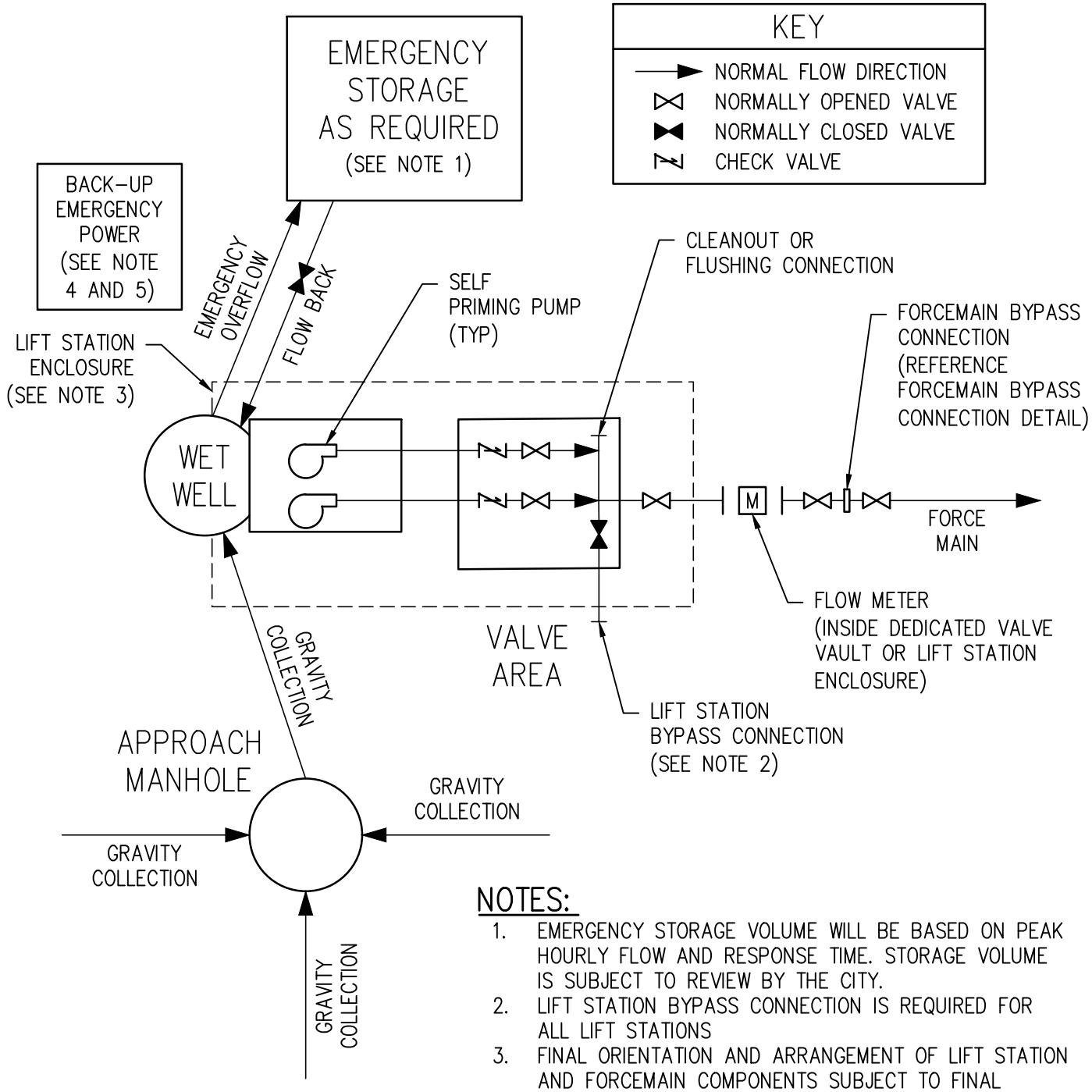
11. Standard Details

    a. Flow Schematic

    b. Below Grade Lift Station

    c. Above Grade Lift Station

    d. Bypass Pumping Detail



NOTES:

1. EMERGENCY STORAGE VOLUME WILL BE BASED ON PEAK HOURLY FLOW AND RESPONSE TIME. STORAGE VOLUME IS SUBJECT TO REVIEW BY THE CITY.
2. LIFT STATION BYPASS CONNECTION IS REQUIRED FOR ALL LIFT STATIONS
3. FINAL ORIENTATION AND ARRANGEMENT OF LIFT STATION AND FORCEMAIN COMPONENTS SUBJECT TO FINAL APPROVAL BY CITY.
4. BACK-UP EMERGENCY POWER SYSTEM INCLUDED W/ PUMP MANUFACTURER.
5. SKID-MOUNTED NATURAL GAS DRIVEN ENGINES INTEGRAL WITH SKID-MOUNTED LIFT STATION PUMP SYSTEM PREFERRED FOR BACK-UP EMERGENCY POWER SYSTEMS.

LIFT STATION FLOW SCHEMATIC

GREELEY LIFT STATION DESIGN CRITERIA

AUGUST 2018

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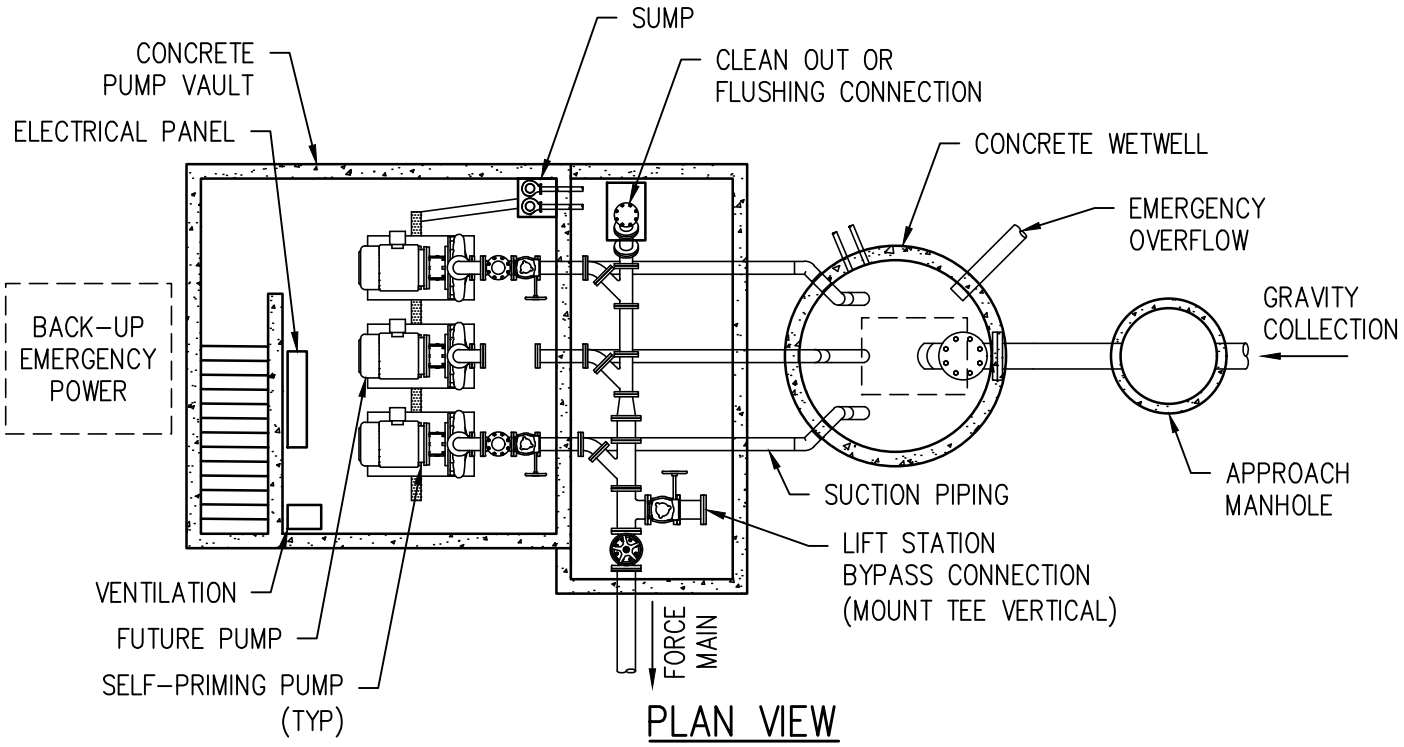
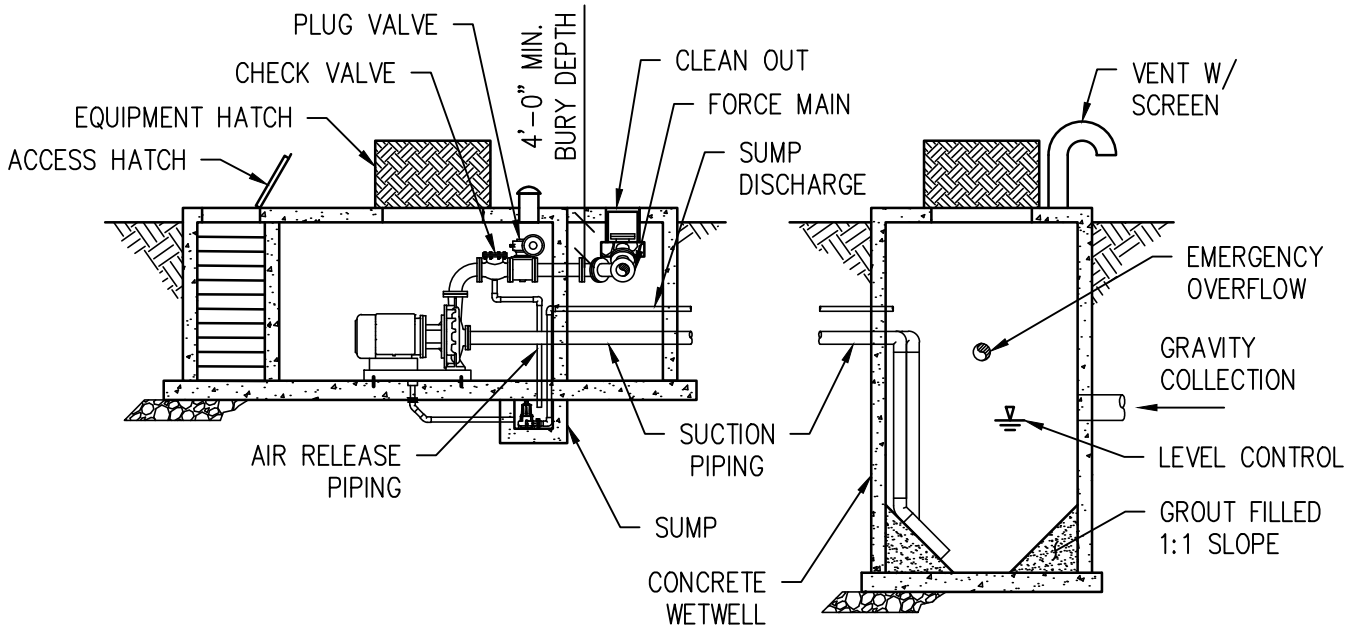


PLAN VIEW



SECTION VIEW

BELOW GRADE LIFT STATION

GREELEY LIFT STATION DESIGN CRITERIA

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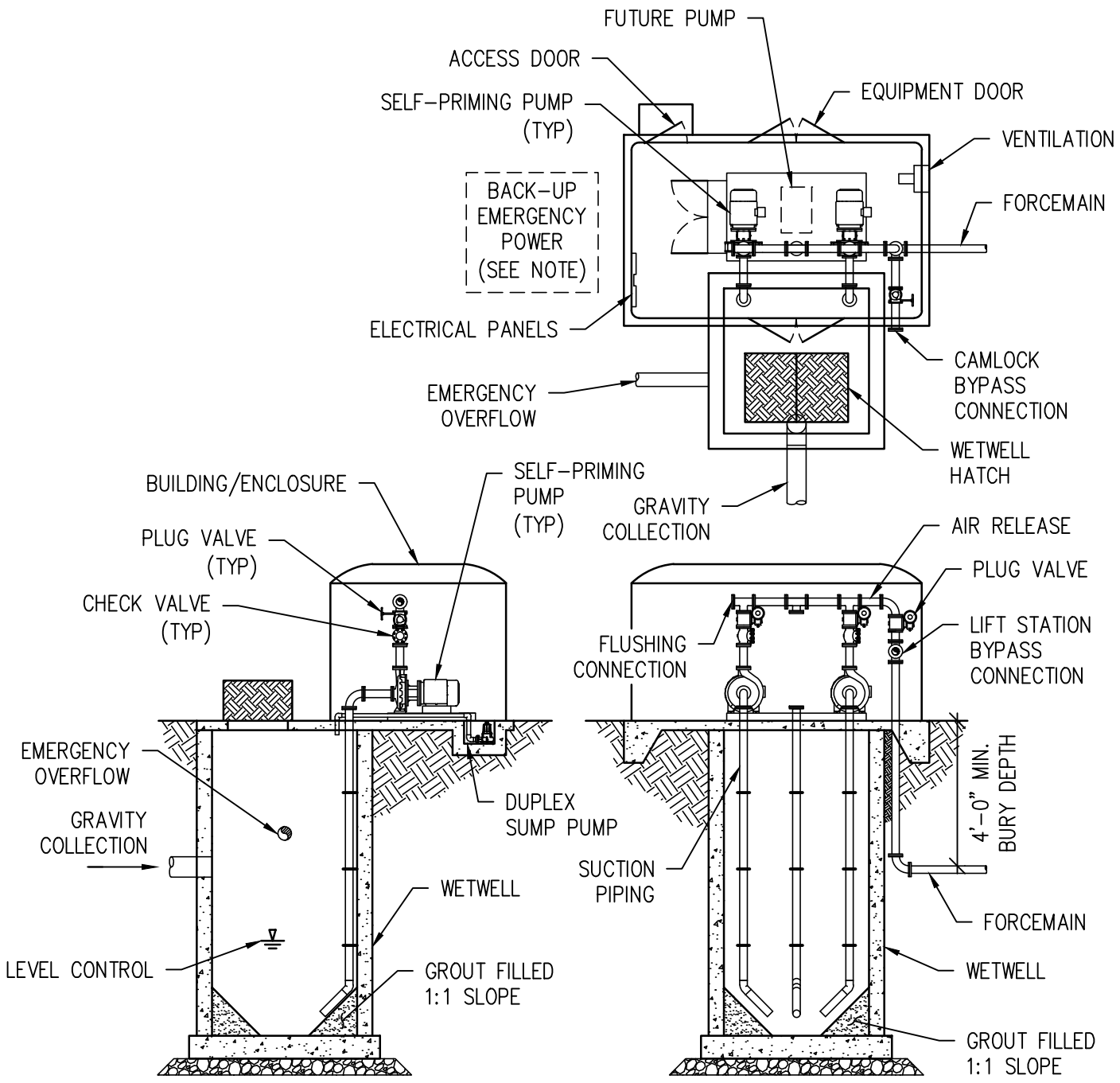

NOTES:

1. BACK-UP POWER SYSTEMS SHALL BE PROVIDED BY PUMP MANUFACTURER.

ABOVE GRADE LIFT STATION

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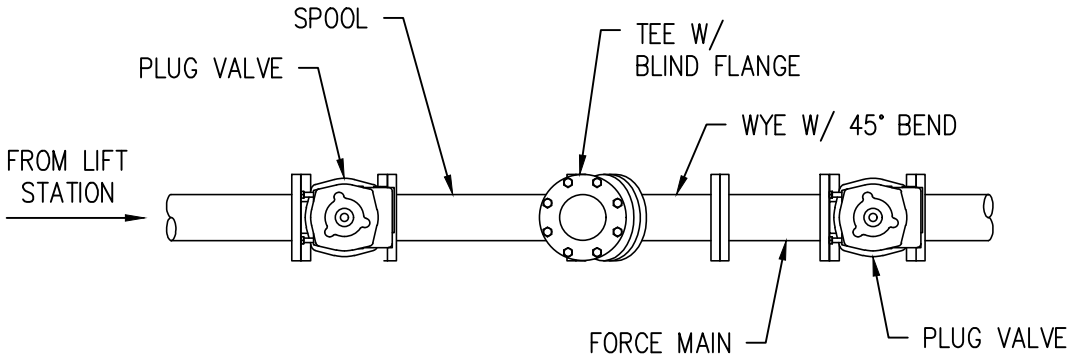
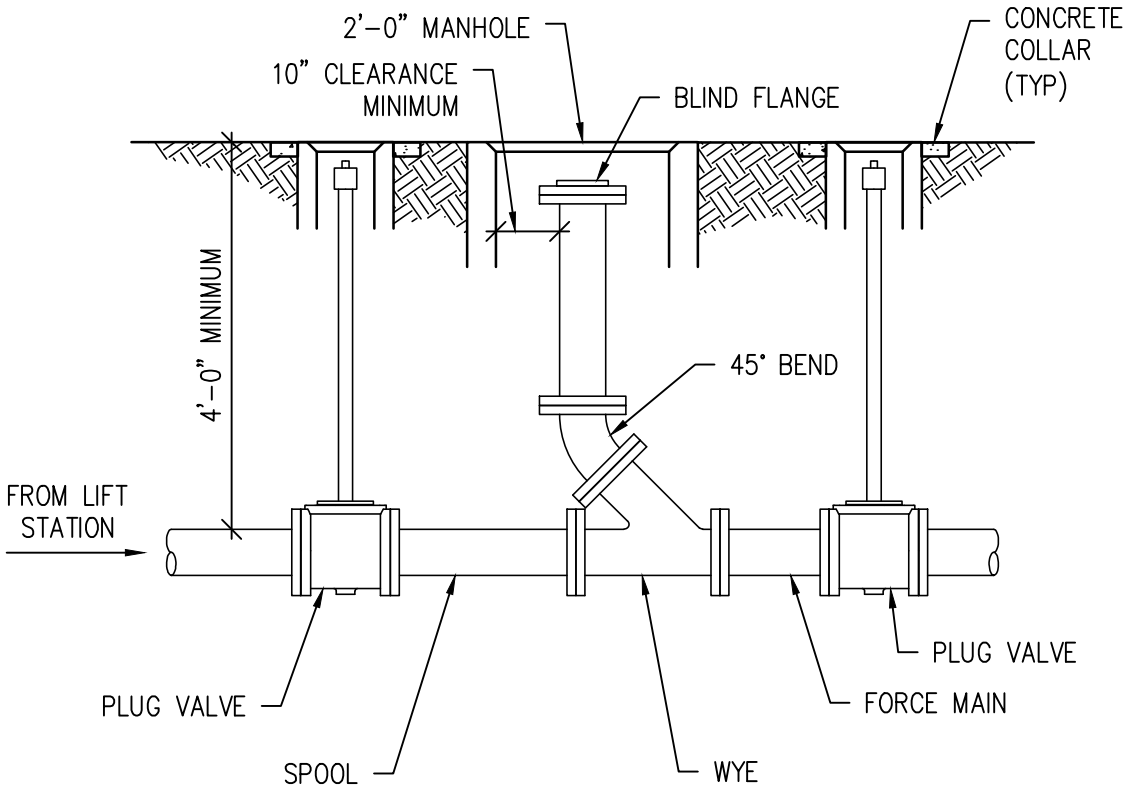


PLAN VIEW



SECTION VIEW

FORCEMAIN BYPASS & CLEANOUT CONNECTION DETAIL

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