Texas Commission on Environmental Quality
Lift Stations and Force Mains
General Construction Notes

1. This lift station and/or force main must be designed and constructed in accordance with the Texas Commission on Environmental Quality's (TCEQ) Edwards Aquifer Rules 30 Texas Administrative Code (TAC) §213.5(c), the Design Criteria for Domestic Wastewater Systems 30 TAC Chapter 217, and the City of _____ Standard Specifications.

2. Any modification to the activities described in the referenced Lift Station/Force Main System application following the date of approval may require the submittal of a Lift Station/Force Main System application to modify this approval, including the payment of appropriate fees and all information necessary for its review and approval.

3. Prior to commencing any regulated activity, the applicant or his agent must notify the _____ Regional Office, in writing, of the date on which the regulated activity will begin.

4. Upon completion of the wet well excavation, a geologist must certify that the excavation has been inspected for the presence of sensitive features and the certification must be submitted to the appropriate regional office. Further activities may not proceed until the executive director has reviewed and approved the methods proposed to protect any sensitive feature and the Edwards Aquifer from potentially adverse impacts to water quality from the lift station. Construction may continue if the geologist certifies that no sensitive feature or features are present.

5. If any sensitive features are discovered during the wastewater line trenching activities, all regulated activities near the sensitive feature must be suspended immediately. The applicant must immediately notify the appropriate regional office of the Texas Commission on Environmental Quality of the feature discovery. A geologist's assessment of the location and extent of the feature discovered must be reported to that regional office in writing within two working days. The applicant must submit a plan for ensuring the structural integrity of the sewer line or for modifying the proposed collection system alignment around the feature. The regulated activities near the sensitive feature may not proceed until the executive director has reviewed and approved the methods proposed to protect the sensitive feature and the Edwards Aquifer from any potentially adverse impacts to water quality while maintaining the structural integrity of the line.

6. Lift stations shall be designed to withstand and operate during a 100-year flood event and shall be accessible during a 25-year flood. All lift stations shall be intruder-resistant with a controlled access.

7. Dry well sump pumps:
   (a) A dry well must use dual sump pumps, each with a minimum capacity of 1,000 gallons per hour and capable of handling the volume of liquid generated during peak operations.
   (b) A pump must have a submersible motor and watertight wiring.
   (c) A dry well floor must slope toward a sump sized for proper drainage.
   (d) The minimum sump depth is 6.0 inches and must prevent standing water on a dry well floor under normal operation.
   (e) A sump pump must operate automatically by use of a float switch or other level-detecting device.
   (f) A sump pump must use separate pipes capable of discharging more than the maximum liquid level of an associated wet well.
   (g) A sump pump outlet pipe must be at least 1.5 inches in diameter and have at least two

check valves in series.

8. Pump Controls.
   (a) A lift station pump must operate automatically, based on the water level in a wet well.
   (b) The location of a wet well level mechanism must ensure that the mechanism is unaffected by currents, rags, grease, or other floating materials.
   (c) A level mechanism must be accessible without entering the wet well.
   (d) Wet well controls with a bubbler system require dual air supply and dual controls.
   (e) Motor control centers must be mounted at least 4.0 inches above grade to prevent water intrusion and corrosion from standing water in the enclosure.
   (f) Electrical equipment and electrical connections in a wet well or a dry well must meet National Fire Prevention Association 70 National Electric Code explosion prevention requirements, unless continuous ventilation is provided.

9. Wet wells.
   (a) A wet well must be enclosed by watertight and gas tight walls.
   (b) A penetration through a wall of a wet well must be gas tight.
   (c) A wet well must not contain equipment requiring regular or routine inspection or maintenance, unless inspection and maintenance can be done without staff entering the wet well.
   (d) A gravity pipe discharging to a wet well must be located so that the invert elevation is above the liquid level of a pump's "on" setting.
   (e) Gate valves and check valves are prohibited in a wet well.
   (f) Gate valves and check valves may be located in a valve vault next to a wet well or in a dry well.
   (g) Pump cycle time, based on peak flow, must equal or exceed those in the following table:

Pump Horsepower	**Minimum Cycle Times** *(minutes)*
< 50	6
50-100	10
> 100	15

   (h) An evaluation of minimum wet well volume requires the following formula:

$$V = \frac{T \times Q}{4 \times 7.48}$$

Where:
V = Active volume (cubic feet)
Q = Pump capacity (gallons per minute)
T = Cycle time (minutes)
7.48 = Conversion factor (gallons/cubic foot)

10. Wet Well Slopes.
   (a) A wet well floor must have a smooth finish and minimum slope of 10% to a pump intake.
   (b) A wet well design must prevent deposition of solids under normal operating conditions.
   (c) A lift station with greater than 5.0 million gallons per day firm pumping capacity must have anti-vortex baffling.

11. Dry well access.
    (a) An underground dry well must be accessible.
    (b) A stairway in a dry well must use non-slip steps and conform to Occupational Safety and Health Administration regulations with respect to rise and run.
    (c) A ladder in a dry well must made of non-conductive material and rated for the load necessary for staff and equipment to descend and ascend.

12. Ventilation shall be provided for lift stations, including both wet and dry wells.

13. Hoisting Equipment. A lift station must have permanent hoisting equipment or be accessible to portable hoisting equipment for removal of pumps, motors, valves, pipes, and other similar equipment.

14. A floor drain from a valve vault to a wet well must prevent gas from entering a valve vault by including flap valves, "P" traps, submerged outlets, or a combination of these devices.

15. Pumps.
    (a) General Requirements. A raw wastewater pump, with the exception of a grinder pump, must:
        (1) be designed to prevent clogging;
        (2) be capable of passing a sphere of 2.5 inches in diameter or greater; and
        (3) have greater than 3.0 inch diameter suction and discharge openings.
    (b) Submersible and Non-submersible Pumps.
        (1) A non-submersible pump must have inspection and cleanout plates on both the suction and discharge sides of each pumping unit that facilitate locating and removing blockage-causing materials, unless the pump design accommodates easy removal of the rotation elements.
        (2) A pump support must prevent movement and vibration during operation.
        (3) A submersible pump must use a rail-type pump support system with manufacturer-approved mechanisms designed to allow personnel to remove and replace any single pump without entering or dewatering the wet well.
        (4) Submersible pump rails and lifting chains must be constructed of a material that performs to at least the standard of Series 300 stainless steel.
    (c) Lift Station Pumping Capacity. The firm pumping capacity of a lift station must handle the expected peak flow.
    (d) Pump Head Calculations.
        (1) An owner shall select a pump based upon analysis of the system head and pump capacity curves that determine the pumping capacities alone and with other pumps as the total dynamic-head increases due to additional flows pumped through a force main.
        (2) The pipe head loss calculations, using the Hydraulic Institute Standards, pertaining to head losses through pipes, valves, and fittings, must be included in the report.
        (3) The selected friction coefficient (Hazen-Williams "C" value) used in friction head loss calculations must be based on the pipe material selected.
        (4) For a lift station with more than two pumps, a force main in excess of one-half mile, or firm pumping capacity of 100 gallons per minute or greater, system curves must be provided for both the normal and peak operating conditions at C values for proposed and existing pipe.
    (e) Flow Control.
        (1) A lift station or a transfer pumping station located at or discharging directly to a wastewater treatment system must have a peak pump capacity equal to or less than the peak design flow, unless equalization is provided.

(2) A wastewater treatment system with a peak flow that is greater than 300,000 gallon per day must use three or more pumps, unless duplex, automatically controlled, variable capacity pumps are provided.

(f) Self-Priming Pumps.

(1) A self-priming pump must be capable of priming without reliance upon a separate priming system, an internal flap valve, or any external means for priming.

(2) A self-priming pump must use a suction pipe velocity at least 3.0 feet per second but not more than 7.0 feet per second, and must incorporate its own suction pipe.

(3) A self-priming pump must vent air back into the wet well during priming.

(g) Vacuum-Priming Pumps.

(1) A vacuum-primed pump must be capable of priming by using a separate positive priming system with a dedicated vacuum pump for each main wastewater pump.

(2) A vacuum-priming pump must use a suction pipe velocity at least 3.0 feet per second but less than 7.0 feet per second and must have its own suction pipe.

(h) Vertical Positioning of Pumps. A raw wastewater pump must have positive static suction head during normal on-off cycling, except a submersible pump with "no suction" pipes, a vacuum-primed pump, or a self-priming unit capable of satisfactory operation under any negative suction head anticipated for the lift station.

(i) Individual Grinder Pumps. A grinder pump serving only one residential or commercial structure that is privately owned, maintained, and operated is not subject to the rules of this chapter.

(j) Pump for Low-Flow Lift Station. A pump used for a lift station with a peak flow of less than 120 gallons per minute must be submersible and include a grinder.

16. Piping.

(a) Horizontal Pump Suctions.

(1) Each pump must have a separate suction pipe that uses an eccentric reducer.

(2) Pipes in a wet well must have a turndown type flared intake.

(b) Valves.

(1) The discharge side of each pump followed by a full-closing isolation valve must also have a check valve.

(A) A check valve must be a swing type valve with an external lever.

(B) A valve must include a position indicator to show its open and closed positions, unless a full-closing valve is a rising-stem gate valve.

(2) A grinder pump installation may use a rubber-ball check valve or a swing-type check valve.

(3) A butterfly valve, tilting-disc check valve, or any other valve using a tilting-disc in a flow pipe is prohibited.

(c) Pipes.

(1) A lift station pipe must have flanged or flexible connections to allow for removal of pumps and valves without interruption of the lift station operations.

(2) Wall penetrations must allow for pipe flexure while excluding exfiltration or infiltration.

(3) Pipe suction velocities must be at least 3.0 feet per second but not more than 7.0 feet per second.

17. Emergency Provisions for Lift Stations.

(a) A collection system lift station must be equipped with a tested quick-connect mechanism or a transfer switch properly sized to connect to a portable generator, if not equipped with an onsite generator.

(b) Lift stations must include an audiovisual alarm system and the system must transmit all alarm conditions through use of an auto-dialer system, Supervisory Control and Data Acquisition system, or telemetering system connected to a continuously monitored location.

(c) An alarm system must self-activate for a power outage, pump failure, or a high wet well water level.

(d) A lift station constructed to pump raw wastewater must have service reliability based on:

(1) Retention Capacity.

(A) The retention capacity in a lift station's wet well and incoming gravity pipes must prevent discharges of untreated wastewater at the lift station or any point upstream for a period of time equal to the longest electrical outage recorded during the past 24 months, but not less than 20 minutes.

(B) For calculation purposes, the outage period begins when a lift station pump finished its last normal cycle, excluding a standby pump.

(2) On-Site Generators. A lift station may be provided emergency power by on-site, automatic electrical generators sized to operate the lift station at its firm pumping capacity or at the average daily flow, if the peak flow can be stored in the collection system.

(3) Portable Generators and Pumps.

(A) A lift station may use portable generators and pumps to guarantee service if the report includes:

(i) the storage location of each generator and pump;

(ii) the amount of time that will be needed to transport each generator or pump to a lift station;

(iii) the number of lift stations for which each generator or pump is dedicated as a backup; and

(iv) the type of routine maintenance and upkeep planned for each portable generator and pump to ensure that they will be operational when needed.

(B) An operator that is knowledgeable in operation of the portable generators and pumps shall be on call 24 hours per day every day.

(C) The size of a portable generator must handle the firm pumping capacity of the lift station.

(e) Spill Containment Structures.

(1) The use of a spill containment structure as a sole means of providing service reliability is prohibited.

(2) A lift station may use a spill containment structure in addition to one of the service reliability options detailed in this in subsection (a) of this section.

(3) The report must include a detailed management plan for cleaning and maintaining each spill containment structure.

(4) A spill containment structure must have a locked gate and be surrounded an intruder resistant fence that is 6.0 feet high chain link, masonry, or board fence with at least three strands of barbed wire or 8.0 feet high chain link, masonry, or board fence with at least one strand of barbed wire.

(f) A lift station must be fully accessible during a 25-year 24-hour rainfall event.

(g) Lift station system controls must prevent over-pumping upon resumption of normal power after a power failure. Backup or standby units must be electrically interlocked to prevent operation at the same time that other lift stations pumps are operating only on the resumption of normal power after a power failure.

THESE LIFT STATION AND FORCE MAINS CONSTRUCTION NOTES MUST BE INCLUDED ON

THE CONSTRUCTION PLANS PROVIDED TO THE CONTRACTOR AND ALL SUBCONTRACTORS.