4.0 SEWER LIFT STATION AND FORCE MAIN GUIDELINES

4.01 INTRODUCTION

Sewage collection within Western Municipal Water District's (Western's) service area shall be provided by the construction of gravity sewers, except where it is demonstrated unfeasible and pumping is required. If a sewage lift station is proposed, it shall be the developer's responsibility to provide the services of a licensed civil engineer to demonstrate to Western that a sewage lift station is the most economical method, including all life-cycle costs, for sewage conveyance.

These guidelines present basic concepts and general criteria for sewage lift station facilities. **Each lift station shall be reviewed and approved by Western from concept through design, construction, and start-up**. Sample Guideline Drawings LS-1 through LS-5 are provided to present general lift station arrangement and components of construction. Utilizing the guidelines the Developer shall prepare a complete site-specific Lift Station drawing and specs, references to LS-1 through LS-5 are not acceptable, and submit the design to Western for review and approval.

Developer's Engineer shall be responsible for acquiring all necessary certifications and permits.

4.02 PROCEDURES

A. Procedures required for Western approval of sewage lift stations are as follows:

1. Developer and engineer shall meet with Western to demonstrate the need for a sewage lift station prior to preparing specific design and said meeting shall include review of the following:
   - Requirements
   - Guidelines
   - Criteria
   - Right-of-way
   - Location of specific project facilities
   - Life-cycle economic analysis

2. Developer's engineer shall utilize Western's Sewer Lift Station guidelines in preparing design.

3. Developer shall submit documentation to Western to demonstrate need for lift station, complete calculations for entire drainage area flows, and size lift station for present planned development and ultimate development.

4. Submit design, drawings, specifications, and all supporting calculations for Western approval as follows:

a. Preliminary design including capacity, hydraulic design, pump selection and system curves, preliminary site layout, and list of selected equipment and materials. Depending upon location, Western will establish site improvements such as block wall, asphalt concrete or concrete pavement, lighting, access, etc. Western will provide specialty specifications to be utilized.

b. The sequence for submission of construction drawings and specifications shall be 75% complete, 95% complete, and Final Design.

c. Shop drawing submittals for all equipment and materials prior to construction.

5. Construction of facilities shall be in accordance with Western guidelines for construction.

6. Western staff shall receive operation and maintenance manuals for all equipment a minimum of 10 working days prior to receiving training for station operation and equipment operation. A factory trained equipment manufacturer's representative shall provide the training.

4.03 GENERAL

A. Facilities shall be designed by a licensed civil engineer, registered in the State of California, experienced in the design of wastewater facilities. Force main and lift station construction drawings shall be submitted simultaneously.

B. All costs of facilities including but not limited to the cost of all permit fees, connection fees, utility charges, and inspection fees shall be borne by the developer.

C. Upon approval and acceptance by Western, facilities shall be owned by Western. Ownership shall include the lift station site and right-of-way for force main and gravity sewers. The wet well, vaults, above-ground pipe, and structures associated with the lift station shall reside within property conveyed to Western by a Fee Title. Gravity sewers and force main shall be constructed on Western property, Western right-of-way, or within public right-of-way whenever possible. Easements for gravity sewers and force main will only be considered under special conditions. All right-of-way and easement documents shall be submitted to and approved by Western prior to approval of the construction drawings. All right-of-way and easement documents shall be conveyed to Western and recorded prior to acceptance of facilities.

D. Developer shall guarantee all facilities free of defect for a period of one year after final acceptance of all facilities by Western. The developer, at no cost to Western, shall repair any deficiencies occurring during the one-year period. A performance bond approved by Western shall be furnished. All manufacturer's

warranties shall be fully transferred to Western.

E. Prior to completion of the facility and Western acceptance, complete records shall be furnished to Western including:

1. As-Built record drawings

2. Final approved shop drawings and submittals for all equipment and materials

3. As-built electrical and control diagrams

4. Electronic format of programmable logic controller.

5. Three hard copies and one electronic copy of Operation and Maintenance Manuals for all equipment

6. Western staff training for station operation and equipment operation and maintenance

7. Right-of-way, grant deed, and easement records

8. All construction and operating permits

F. The lift station will receive Notice of Final Inspection by Western only after all deficiencies listed in the Engineer's Inspection Report are corrected.

G. No sewer flow shall be allowed to enter a lift station prior to final acceptance.

4.04 CAPACITY

A. Size and capacity of facilities shall be based on design flow as calculated in Section 3.01 for the development to be serviced with consideration of the entire drainage area and master planned facilities. Flows shall be provided for initial and ultimate conditions. If necessary, lift stations shall be located to maximize sewage collection for the entire drainage area and shall conform to Western's Wastewater Master Plan. Lift station pumping capacity may be dictated by minimum acceptable force main size and velocities therein.

B. Where Master Plan facilities have not been established, the Developer shall be responsible to prepare wastewater flow projections for the drainage area.

C. Hydraulic calculations and system/pump curves for pump sizing and required capacity shall be submitted for both initial and ultimate design flow. System curves shall be developed for friction coefficients of C=100, C=130 and C=150.

4.05 SEWAGE LIFT STATION SITE

A. Site shall be of adequate size to operate, maintain, and repair the lift station facilities including access for truck cranes and sewer vacuum cleaning trucks such that trucks can traverse the site without needing to go in reverse.

B. All sewage lift station sites require the parcel to be deeded to Western. Before construction, a Grant Deed with legal description and plat map must be prepared, approved, and recordation shall occur by Western.

C. Site shall be secured by masonry block wall. One rolling gate and one personnel access gate shall be provided.

D. Site shall be provided with weed control, A.C. pavement, concrete driveway, adequate drainage facilities, and concrete sidewalks.

E. If required by Western, based on proximity of the facility to other public facilities, residences, or buildings, landscaping and architectural finish of facilities shall be provided in accordance with the surrounding area.

F. Potable water shall be provided to the site by hose bibs with antisiphon devices, water meter, and a backflow device per standard.

G. All lift stations shall have a street address sign affixed to the fence at the front of the station and Western standard signage per Western Standards.

H. Recycled water shall be provided where available.

I. Site shall be designed with a lighting system operating on a photocell and on/off switch with a manual switch override located within the Control Building. Site lighting shall be designed to minimize off site impacts while maintaining functionality for maintenance personnel working on lift station components.

4.06 FORCE MAIN

A. Force main size (diameter) shall be based on the following.

1. Minimum size shall be 4-inch diameter.

2. Velocity at design flow design point between 4 fps and 5 fps.

3. Minimum velocity of 3 fps and maximum velocity of 7 fps under all operating conditions. Western shall approve all proposed operating conditions.

B. Material shall be PVC, ANSI/AWWA C900 minimum DR-18 Class 315. Pipeline shall be constructed using restrained joints.

C. Pipeline profile shall avoid intermediate high points if feasible. All high points shall be provided with combination sewage air and vacuum valve installation and shall be made with corrosion resistant pipeline materials.

D. Pipe cover shall be minimum 48-inches.

E. Pipe bedding and backfill in pipe zone to 12-inches above pipe shall be sandy soil with sand equivalent of 50 compacted to minimum 90% relative compaction. Remaining backfill shall be minimum 90% and in accordance with Western standards, unless soils engineer or encroachment permit requirements are more stringent.

F. Separation from water lines shall be in accordance with current California Department of Public Health requirements.

G. Force main shall be pressure and leak tested at pipe class pressure in accordance with Standard Specification.

4.07 LIFT STATION

A. Sewage lift station shall be the submersible type with 100% redundancy, electrical service, switchgear, emergency power, control building, and appurtenances. Sample Drawings LS-1 through LS-5 are provided to present general arrangement and components for the lift station.

B. Sewage Pumps.

1. Number of pumps furnished shall provide complete redundancy. Minimum of two identical pumps, each sized for 100% station capacity, shall be installed. Discharge to the downstream system may require use of variable speed drives.

2. Pump Specifications.

a. Sewage non-clog submersible pumps.

b. Minimum 4-inch discharge.

c. Ability to pass minimum 2-inch diameter sphere.

d. Maximum 1800 rpm explosion-proof submersible motor with moisture and temperature sensors.

e. Motor and cooling rating suitable to run dry for 15 minutes without damage to the pump.

f. UL or Factory Mutual explosion-proof rating without being submerged.

g. Constructed of corrosion resistant materials and provided with corrosion resistant factory coating.

h. Prior to acceptance, pump tests shall be performed to verify pump curves and system head curves.

3. Pump Mounting and Removal.

a. Provide rail-type guide system with intermediate supports to allow pump removal without removal of discharge piping or entering the wet well. All materials are to be stainless steel.

b. Provide stainless steel cable fastened to each pump.

c. Chemical resistant electrical cable(s) shall be spliced at a junction box located 36-inches above wet well roof and meet all provisions of the NEC.

4. Spare parts shall be one complete pump.

C. Wet Well Specifications.

1. Cast-in-place concrete or precast concrete pipe constructed watertight, with concrete base and cover. Wet well shall be place on a 24-inch thick mat of crushed rock. Concrete shall be designed with an approved liner on the interior wet well walls and roof. Wet well bottom shall slope towards pumps.

2. Size shall be based on maximum pump cycling of five times per hour and to provide adequate spacing to permit adjacent pumps to operate simultaneously. Wet well shall have an emergency storage capacity of a minimum of 60 minutes at peak flow conditions. (Use of storage within the gravity sewer is not acceptable.)

3. Concrete roof shall have hatch openings (one hatch per pump) for pump removal and access hatch for floats and level transducer. Hatches shall be aluminum construction per Approved Materials List with stainless steel hardware, lockable diamond plate cover, safety chain, and spring assisted hinges, fall through protection and railing. Hatch plate shall be indelibly imprinted per Approved Materials List to indicate Western ownership.

4. Discharge piping shall be steel epoxy lined and coated for extremely corrosive exposure per Western Standards for Painting and Coating specifications. Discharge piping shall be designed for a maximum velocity of 7 feet per second. Discharge piping shall be properly supported with pipe supports.

5. Pipe supports, brackets, and all other equipment and fasteners within the wet well shall be stainless steel and designed such as to not obstruct inlet.

6. All collection sewers shall join and enter a single manhole just prior to entering the wet well. Only one sewer shall enter the wet well to allow Western to plug influent sewer and bypass around wet well for maintenance and repairs.

7. A concrete pad for pump wash down shall be located adjacent to the wet well for pump wash down. Pad shall be provided with a drain and P-trap draining back into the wet well. A water wash down hose bib shall be provided, recycled water if available. A backflow device will be required at the meter.

D. Pump Discharge Piping Out of Wet Well

1. Unless otherwise specified, discharge from each pump shall exit the wet well and enter a concrete vault with easy access to valves and piping.

2. Valve vault shall be precast concrete vault with concrete floor. Cover shall be aluminum construction with spring assisted hinged covers designed for parkway loading.

3. Each pump shall be provided with a swing check valve and shut-off valves (eccentric non-lubricated plug valve) per District standards. Combination air and vacuum valves, suitable for sewer application, shall be provided at high points.

4. A bypass connection to the force main shall be provided to bypass station with portable pumps.

5. A magnetic type flow meter (type and model to be approved by Western) shall be installed on the discharge piping to provide instantaneous flow and total flow from the lift station.

E. Odor Control.

1. Sewage lift station shall include a Vapex Hydroxyl Ion Fog Odor Control facility (or Western approved equivalent). Odor control facilities may include but are not limited to: air scrubber system, chemical addition, wet well aeration, and/or aeration of the force main. All equipment shall include all required construction and operating permits (i.e. SCAQMD) and permits shall be provided to Western in Western's name.

2. Provide odor control equipment if determined necessary by Western. If odor control is not required, provisions for future addition of odor control

facilities (i.e. installation of ventilation pipe and penetration into wet well for future connections) shall be provided.

4.08 ELECTRICAL AND CONTROLS

A. All electrical equipment shall be in accordance with the NEC and, where applicable, meet all requirements for hazardous locations. Developer shall coordinate with the 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 applicable standards of the utility provider. Single-phase 120-volt power shall be provided for lights, controls, convenience receptacles, and miscellaneous equipment. Provide a minimum of four spare 120-volt circuit breakers. All conduit shall be run concealed below grade or in concrete slabs, and shall not impose tripping or maintenance hazards. All exposed conduit shall be PVC coated galvanized rigid metal pipe.

B. Automatic transfer switch (ATS) shall be provided to switch from normal utility power to standby emergency power upon normal power failure, and switch back to normal power when restored. ATS shall have indicating lights for normal power, emergency power, and a digital panel indicating volts and amps. Acceptable manufactures are ONAN, Zenith, Russelectric or approved equivalent.

C. Electric switchgear shall be mounted in NEMA 12 Motor Control Center with removable buckets, and shall include, as a minimum, Motor Circuit Protector (MCP), motor starters with electronic overload protection, selector switch (hand-off-load-standby), run and fail lights, control transformer, and elapsed time meter. All motors shall be protected by a power monitor, which monitors phase un-balance, phase reversal, and high or low voltage. Switchgear shall be Cutler-Hammer, Allen Bradley, Square "D", or equal.

D. Complete controls for automatic pump operation shall be provided using Milltronics ultrasonic level controller and float switches as back-up. HOA switch for each pump and selector switches shall allow for any pump to operate in any position (lead, lag, or standby). Controls shall limit pump operation and start up on emergency power to prevent overloading the standby generator.

E. Milltronics ultrasonic level controller shall have a minimum of five differential level set points for low water level, start/stop lead pump, start/stop lag pump, start/stop standby pump (if required), and high water level. Controller shall have a digital screen for programming and to indicate water level and be capable of outputting an 4-20ma signal corresponding to water level.

F. Back-up float switches shall be provided for low water level and high water level. High and low water levels shall override Milltronics unit, and shall start all pumps and stop all respectively. Float switches shall be Flygt, Roto-Float, Warrick, or Consolidated Electric Co. provided with intrinsically safe relays. Install floats so levels are readily adjustable.

G. Controls shall provide automatic reset of alarm conditions for normal power fail, high water level, low water level, standby pump run, and a common alarm contact. However, alarm conditions shall activate an alarm light, which once activated shall require manual reset. Each pump shall be provided with alarm light and pump shut down for pump high temperature, pump moisture and pump overload fail conditions. Pump alarm conditions shall require manual reset. Where programmable logic controllers are provided, battery backup shall be furnished.

4.09 EMERGENCY POWER

A. Provide prefabricated skid-mounted diesel engine driven, radiator-cooled, automatic emergency standby generator to power the lift station during normal power failure. Liquid Propane or Natural Gas may be considered based on site location and availability.

B. Acceptable manufacturers are Onan, Caterpillar or approved equivalent.

C. Generator shall automatically start upon failure of normal power and be sized to operate lighting loads, and number of pumps necessary to meet flow requirements with maximum voltage DIP of 20 percent. Where two-pump station is provided, the generator shall be sized to sequence start and run both pumps.

D. Exhaust system shall be fully insulated and equipped with a residential-type silencer.

E. Fuel tank for generator shall be base type mounted with unit or aboveground out-of-doors. Tank shall be double-wall welded steel sized for 24 hours of continuous operation at 100% of generator capacity. Tank shall have secondary containment and alarm floats for low fuel and fuel in containment area. Facilities shall meet fire department criteria.

F. Furnish all air quality permits, including payment of fees for the first year of operation. Permits shall have no less than a 200 hour annual operating limit and shall be in Western's name. The permit to construct shall be transferred into a permit to operate prior to acceptance by Western.

4.10 TELEMETRY EQUIPMENT

A. Provide Western standard telemetry equipment system to transmit alarm conditions to existing central receiving system at Western's Operations Center. Provide facilities at Western's Operations Center central receiving system to receive and display alarms.

B. Connection to Western's SCADA telemetry system shall be provided through radio telemetry. Consult with Western regarding selection of telemetry based on

project location, radio receiver capability or other operational requirements.

C. Provide telemetry signals as follows; common alarm, normal power failure, wet well water level (4-20 mA), auto status of pump including status of lead/lag or alternative mode operation, discharge pumping flowrate (4-20 mA) and pump fail, at a minimum. Western shall approve final signal requirements based on operational requirements of the particular installation.

4.11 CONTROL BUILDING

A. Masonry block building to house roll-up door, standby generator, electrical service, switchgear, and controls.

B. Building construction.

1. Colored masonry block, solid grouted.
2. Concrete footing and slab.
3. Isolated concrete generator foundation.
4. Wood roof with lightweight concrete shingles.
5. Dry wall ceiling with insulation.
6. Thermostat and timer operated forced air ventilation (roof exhausters).
7. Metal doors with dead bolt locks.

C. Sized for ease of operation and maintenance.

4.12 MISCELLANEOUS MATERIALS

A. Concrete shall be reinforced concrete Class 560-C-3250 with materials and installation per Standard Specifications.

B. Earthwork shall be in accordance with Standard Specifications. All backfill shall be considered structural backfill and compacted to a minimum 90% or 95% relative compaction depending on location, or as required by the soils engineer or encroachment permit if more stringent.

4.13 SEWER LIFT STATION DRAWINGS LS-1 – LS-5 (TABLE OF CONTENTS ONLY)

Lift Station Plan	LS-1
Lift Station Hatch Plan	LS-2
Lift Station Section	LS-3
Control Building Plan	LS-4
Control Building Section	LS-5