APPENDIX G City of Chula Vista Subdivision Manual Section 3-300 – Sewer Design Criteria

GENERAL DESIGN CRITERIA
SECTION 3-300
SEWER DESIGN

3-300 SEWER DESIGN CRITERIA

3-301 Design capacity sewer trunks and mains; - The design criteria for public sewers is based on residential (R1) zoning and land use with a density of 4 dwelling units per acre and 3.3 persons per dwelling unit. Use these figures unless more accurate population or land use studies are available:

3-301.1 Sewage production

(1) Residential = 80 gallons (304 lpcd) per capita per day (gpcd) or 265 gallons (1006 liters) per EDU, per day.

(2) School flow:

a) Elementary Schools: 15 gpcd (57 lpcd).

b) Junior High and High Schools: 20 gpcd (76 lpcd).

(3) Commercial/Industrial/Church: 2,500 gpd/acre.

(4) Parks: 500 gpd/acre.

(5) Peak to average ratio: See CVDS 18.

3-301.2 Pipe design capacity based on Manning's flow equation:

(1) Use 1/2 full design flow for diameters up to and including 12 inches.

(2) Use 3/4 full design flow for diameters greater than 12 inches (30cm).

(3) "n" factors

a) for vitrified clay or reinforced concrete pipe:

1) n = 0.013 for pipes up to 21" (53cm) diameter;

2) n = 0.012 for pipes greater than 21" (53cm) diameter;

b) for PVC pipe, n = 0.012 for PVC pipe all sizes.

(4) Velocities:

a) Minimum = 2 feet/second (.61m/s). See Section 3-302.2(6) also.

b) Maximum = 12 feet/second (3.6m/s) (except as approved by City Engineer).

3-302 System Design Criteria

3-302.1 Minimum Pipe Sizes

(1) Public Sewer mains: 8 inches (20cm).

(2) Sewer laterals: 4 inches (10cm).

3-302.2 Grades

(1) Grades shall be determined by using design flow and velocities with the exception that minimum grade for 8" (20cm) sewer shall not be less than 0.4%.

(2) Sewer construction on grades of 20% or more, in newly compacted fills, shall use concrete anchors per Regional Standard Drawing No. S-9, at intervals of not more than 40 feet (12m), between anchors. Backfill shall be rounded over trench.

(3) Sewer constructed on grades of 20% or more, under conditions other than above, shall use cutoff walls per Regional Standard Drawing No. S-10, at intervals of not more than 40 feet (12m), between cutoff walls.

(4) Grades above 65% shall use cast iron pipe, Class 150, without bedding.

(5) Portions of sewer systems, which serve the equivalent of less than 10 residential lots, shall be constructed at a minimum grade of 2% if vitrified clay pipe is used or 1% for PVC pipe.

(6) Sewer mains that do not sustain 2 fps at peak flow shall be designed to have a minimum slope of 1%.

3-302.3 Cradle/Encasement Requirements Depth; (depth of cover is measured from the top of pipe to finish grade)

(1) PVC - Per Manufacturer's Recommendations for long-term deflections not to exceed 5%.

3-302.4 Trenching and Backfill - Regional Standard Drawing No. S-4.

3-302.5 Deep Sewer Requirements

(1) Deep Sewer Connections - Sewer mains greater than 15 feet (5m) deep with lateral connections shall be constructed in conformance with CVCS 14. Parallel sewer line shall be constructed for the full length of the deep sewer.

(2) Deep Sewer Laterals - Sewer laterals greater than 15 feet (5m) deep shall not be permitted without written approval of the City Engineer. A shallower, parallel sewer main shall be constructed to receive the lateral flows. The shallower sewer main shall connect to the deeper sewer at a manhole.

(3) Deep Sewer Mains - Sewer mains greater than 20 feet (6m) deep shall be constructed with PVC pipe, Class 900 for pipe diameters 12-inches or less and Class 905 for pipe diameters greater than 12-inches, from manhole to manhole.

3-302.6 Manholes

(1) Sewer manholes shall be per Regional Standard Drawing Nos. S-2 and M-3.

(2) Maximum distance between manholes = 400 feet (122m).

(3) Maximum distance from manholes to plugs on grades not exceeding 7% = 200 feet (61m).

(4) Manholes shall be provided as determined by the City Engineer.

(5) In a cul-de-sac, all sewers shall terminate in a manhole.

(6) Sewer Cleanouts shall be provided at a maximum of 100 foot (30m) intervals for sewer laterals.

(7) The manhole connecting a force main and gravity sewer and the four downstream manholes, shall be lined with T-lock or equivalent.

(8) Locking manhole covers per RSD M-4 shall be used on all major and prime streets at all intersections.

3-302.7 Sewer Locations

(1) Sewer Trunks and Mains

a) Sewer trunks and mains will normally be located on the centerline of streets for streets without medians unless otherwise approved by the City Engineer.

b) Sewer trunks and mains will normally be located in the center of the driving lane for streets with medians unless otherwise approved by the City Engineer.

c) The angle of connection in manholes for sewer pipes greater than 10" in diameter shall not exceed 45° and 30' minimum shall be provided between the manholes unless otherwise approved by the City Engineer. Manholes shall be centered in driving lanes.

d) Sewer mains between residential lots should be avoided to the maximum extent possible.

(2) Sewer Easements

a) Sewer easements shall be equal to the pipe diameter plus ten feet (3m) or a minimum of 15 (4.6m) feet in width, whichever is greater. Sewer

easement shall not split residential lots unless specifically approved by the City Engineer.

b) Permanent obstructions within (or over) the easement which would hinder the maintenance of sewer facilities within the easement (i.e. fences, walls, steep slopes, overhanging eaves) are not allowed.

c) Easements shall be granted to provide access to all sewer manholes.

(3) Sewers that may be extended in the future shall be constructed to the boundary of the land being developed, or to the end of permanent improvements as determined by the City Engineer.

(4) Sewer and water lines paralleling each other shall be separated by a minimum of 10 feet (3m).

(5) Sewers crossing water lines shall cross under the water line.

(6) Deep sewer connections shall be in accordance with CVCS14.

3-302.8 Sewer constructed along curved alignments

(1) Horizontal Alignment:

a) Minimum pipe centerline radius shall conform to "Green Book" specifications (Table 306-1.2.13 (C)). Lesser radii may be approved in accordance with manufacturer's specifications upon approval of the City Engineer.

b) Curves of radii exceeding 200 feet (61m) may be formed by the deflection of each joint or by use of specially beveled pipe.

c) Curves of radii equal to 200 feet (61m) or less will use two-foot length pipe for every other length when using joint deflections.

d) Short radius curves may be formed by the use of short pipe with deflected joints, beveled pipe, or a combination of both.

(2) Vertical Curvilinear Alignment. Although straight grades are preferred between manholes, vertical curves, using criteria given for horizontal alignment, above may be used upon approval by the City Engineer.

3-302.9 Sewer Laterals

(1) All sewer laterals shall be in accordance with Regional Standard Drawing Nos. S-13.

(2) Deep sewer lateral connections shall be in accordance with CVCS 18. Sewer laterals deeper than 15 feet are not allowed without written approval of the City Engineer.

(3) Minimum grade for sewer laterals is 2%, unless otherwise approved by City Engineer.

(4) Each sewer lateral shall have one sewer cleanout placed at the property line per CVCS-20 and CVCS-21. If the edge of sidewalk is at the property line, the cleanout shall be placed within the adjacent general utility easement.

(5) To the maximum extent possible, sewer laterals shall not be placed under driveways.

3-302.10 Private Sewers

Private sewer mains shall be designed to public standards and shall be submitted for review and approval by the City Engineer.

(1) Private Sewers designed to the plumbing code, plan checked by the Building Division and inspected by the building inspector may be shown on the Engineering Improvement plans with a note specifying what segments of sewer are the responsibility of the Building Inspector.

3-303 Force Sewer Mains and Sewer Pump Stations

3-303.1 General

(1) Construction of force sewer mains and sewage pump stations shall be avoided unless other options are unavailable. Permanent sewer pump stations are not desirable and generally will not be approved. Permanent or temporary sewer pump stations may be approved only in accordance with the provisions of City policy No. 570-03, adopted by Resolution No. 17491.

(2) Easements shall be granted to the City of Chula Vista for all temporary pump stations, as deemed necessary by the City Engineer. Documents granting said easements shall be recorded prior to City acceptance of the pump station. Permanent pump stations shall be located on parcel(s) granted, or owned, in fee to the City of Chula Vista.

(3) Developer shall enter into agreements with the City of Chula Vista that define pump station maintenance, operation, billing, responsibilities, and acceptance of temporary pump stations. Said agreement shall be approved by the City Council and be in accordance with City Policy No. 570-03.

(4) Representatives from the Engineering Department, Public Works Operations, developer, and contractor shall meet prior to start of construction of pump stations.

(5) Pump station plans shall include a site plan, pump curves, specifications, details, profiles, pump head, pump horsepower, pump capacity, cost estimate, emergency storage and complete electrical layout.

(6) Plans for working on existing pump stations during mechanical re-fit, new connection, etc., shall include a note indicating "the Contractor shall provide continuous sewer service including source of power", to insure that residents relying on the pump station will maintain sewer service.

(7) All plans must be approved by the City of Chula Vista Engineering, Operations, Building and Housing, and Development Services departments.

(8) Operational checks and tests shall be performed on site with representatives from Public Works Operations (pump operators, electricians, and sewers), Public Works Inspection, the developer, and equipment suppliers.

(9) All pumping stations will incorporate dual force mains beginning from pumps and ending at gravity flows.

3-303.2 General Pump Station Criteria

(1) Site Work - Site shall be landscaped outside the fence line. Structures and fences/walls shall be constructed, and painted in a style to blend with the surrounding neighborhood, subject to approval by the City of Chula Vista. The area inside the fence shall be paved and shall drain to an approved drainage structure at a minimum slope of 2%.

(2) Access - Station access shall be provided in accordance with the following criteria:

a. Access shall be provided around the entire station.

b. An access road with a minimum width of 20 feet and maximum slope of 15% shall be provided. The station shall have parking for two large trucks with a turnaround. No private gates will be permitted across access roads

c. Station shall be fenced or walled with locking gate to prevent unwanted entry. Fencing or wall shall be in an acceptable manner that blends in with the surrounding community. Fencing shall have three-strand barbed wire on top.

d. If access incorporates a tunnel, the dimensions shall be 20 feet wide by 14 feet high.

e. A minimum 62 ft. driveway radius sweep is required to accommodate large vehicles.

(3) Every pump station shall be provided with emergency storage capacity of a minimum of 6 hours at average ultimate flow. Additional storage capacity may be required when station is located close to a water supply reservoir, the bay front, or any other water way. Emergency storage reservoirs shall be constructed of Portland cement concrete (P.C.C.).

(4) Each pump station shall be provided with two independent power sources. This shall be accomplished by providing an on site diesel generator. Generator switching equipment shall be located in a building.

(5) Below ground stations shall be of fiberglass construction. The maximum allowable cover over a fiberglass enclosure shall be no deeper than 20 feet from top of enclosure.

(6) Phone, SCADA radio and water services shall be provided to all stations.

(7) Screen openings for vents and all other screened areas shall be of sufficient size to prevent infestation from all pests, including bees.

(8) A door or removable ventilation louver shall be installed in generator buildings and be large enough to accommodate removal of the generator.

(9) All stations shall have exterior lighting near the wet well and pump house. Lamps shall be 250 watt high pressure sodium.

(10) Pipes shall be color coded with flow arrows for direction of flow and type of liquid or gas.

(11) All outside doors and frames shall be corrosion and vandal resistant.

(12) Guard rails with toe boards shall be installed around all floor openings and shall have two chains fitted with snap hooks and eyes. All guardrails, chains, snap hooks, eyes and toe boards shall be of non-corrosive materials.

(13) Shower, sink, and eye wash station shall be provided at each station.

(14) Fire extinguisher shall be provided as per Fire Code. Type 2A10BC, one per every 3,000 sq. ft. of building area. A minimum of one fire extinguisher per station.

3-303.3 Other Requirements

(1) A dehumidifier shall be incorporated into all below ground stations.

(2) A bioxide odor control system shall be installed at all pump stations.

(3) Intake air shall be ducted near floor and exhaust air should be near ceiling.

(4) Intake and exhaust points shall be as diagonally opposite as possible.

(5) Both intake and exhaust outside outlets shall be above ground.

(6) Blower and ducting shall be made out of corrosion resistant materials (PVC acceptable).

(7) Screening over ventilation openings shall be made of corrosion resistant materials.

(8) Certified performance test of ventilation system is required for acceptance.

3-303.4 Alarms

(1) SCADA components and alarms - Pump station shall have alarms that shall be telemetered to the designated monitoring station.

(2) Alarms shall be of identical type as City currently utilizes for lift station monitoring. Contact Public Works Operations for specifications.

(3) The station shall be equipped with alarms sound for pump failure, high wet well, low wet well, power failure, generator failure, dry well flooded, and any alarms necessary for equipment safety, or particular installations.

(4) Alarm equipment shall be housed in a water tight, dust proof enclosure.

(5) All telemetry wiring shall be per phone company specifications.

(6) The following is required for alarm hookup:

a) Station must have address.

b) Telephone Company must already have phone lines pulled or laid up to the alarm/pump station. Contractor/developer shall pay for and arrange with Pacific Bell.

c) Conduit from pump station to Telco phone lines with an above ground riser with pull rope.

(7) After alarm is connected, connect the Information Systems:

a) Arrange for Telco to install alarm circuit on existing alarm circuit.

b) Contractor or other to meet Telco by arrangement to have access to alarm station.

c) Notify Public Works Operations of addition of new alarm circuit.

d) Contractor installs alarm electronics at pump station and at 276 Fourth Avenue, or as otherwise directed by Public Works Operations.

e) Communication Division connects new alarm signal to Police Dispatch alarm panel.

(8) Public Works/Engineering will provide account number for City and Pacific Bell charges.

3-303.5 General Equipment Criteria

(1) City shall be provided with four complete sets of manufacturer's brochures, technical data, operating and maintenance manuals, for all equipment and controls. One set shall be on a CD ROM in PDF or other format acceptable to City. City shall be provided a vendors list for all equipment and parts.

(2) A maintenance agreement for all generators installed shall be for one year from time of acceptance of station and shall cover transfer switch.

(3) A 24-hour call list for generator maintenance under warranty and Maintenance Agreement shall be provided.

(4) Training, for maintenance personnel, shall be provided by a manufacturer's representative.

(5) Lifting eyes shall be installed above all equipment.

(6) All equipment shall have adequate clearance to perform maintenance and repair work.

(7) Lighting shall be a minimum 40 foot candles at the machine level and be shadow free.

(8) Guards shall be installed around all moving parts of equipment as required by safety codes and have appropriate safety labels.

(9) All concrete floors shall be treated with an approved sealant and walking areas shall be non-slip.

(10) Step and walkways shall have non-slip surfaces.

(11) Station shall be able to operate independently of SCADA controls.

3-303.6 Electrical/Controls

(1) Panels and sub-panels shall be Square "D" or an approved equal, approved by City Electrician.

(2) All building wiring shall be THHN insulation grade 90øC/194øF minimum and be copper only, and usable in damp and dry locations.

(3) An electronic bubbler system with a backup mercury float switch shall be used for level control.

(4) Each pump shall have hour meter reading in 1/10th hours.

(5) Panel installed shall have indicator light indicating which pump is in operation.

(6) Panel shall display wet well level.

(7) Control panel shall not sit on floor. Mounting shall be at least 3 inches from floor.

(8) All controls shall be vapor proof and conform to all Safety Codes.

(9) Air lines shall have a water trap between compressor and controls.

3-303.7 Pumps

(1) Pump stations shall use pumps approved by City of Chula Vista, Public Works Operations.

(2) Minimum size self-priming pump will be a 3-inch with the ability of passing a 2-1/2 inch sphere.

(3) Submersible pumps shall be avoided when a self-priming pump can be used.

(4) Submersible pumps may only be installed with a minimum of 100 feet TDH (Total Dynamic Head). They must be a minimum size of 4 inches with the ability to pass a 3-inch sphere. Submersibles shall be avoided when a self-priming pump can be used.

(5) The minimum running time for each pump cycle is 5 minutes.

(6) Pump station capacity call be based on peak flow plus a 30% safety factor (Qdesign = 1.3 x Qpeak).

(7) Each pump station shall be equipped with one standby (back-up) pump in addition to the primary pumping unit(s).

(8) The maximum pump motor speed shall be 1,800 RPM.

(9) The most efficient pump performance shall be at the design TDH (Total Dynamic Head).

(10) Each pump shall be lab tested with certified copies of the performance test furnished to Public Works Operations.

(11) All self-priming pumps shall have air release valves 1-inch minimum.

(12) Any drain lines shall be 1-1/4 inch minimum.

(13) Pumps shall have oil filled suction and discharge gauges reading in feet of water (exception of suction gauges on submersible pumps).

(14) Pump motors shall be UL (Underwriters Laboratory) rated or rating acceptable to City Engineer.

(15) Any non-sewage pumps and piping shall be epoxy coated to prevent corrosion.

3-303.8 Plumbing

(1) Discharge lines and manifolds shall be supported and braced.

(2) Sleeves shall be used for wall penetration for pump suction and discharge lines and shall be sealed air-tight.

(3) Water service shall be 1-inch minimum and have an approved backflow prevention device.

(4) Sump lines shall be 1-1/2 inch diameter minimum.

(5) In manifolds, "wyes" are required and shall be the same size as manifold.

(6) Valves:

a) Pump isolation, suction, discharge, and sump line valves shall be plug valves. Valves on forced main and influent to the exterior of the pump station or wet well shall be plug valves.

b) All gauge lines shall have ball valves.

c) All piping either entering or leaving station shall have plug valves on the exterior of station.

d) All valves shall have hand operators geared as required, per manufacturer's recommendations.

e) Check valves shall be between pump and discharge line plug valve and have external spring loaded arm.

f) All valves needing extensions shall have the extensions supplied by contractor.

g) All valves shall be labeled as to their type, function, and operational direction.

3-303.9 Pump Stations - Dry & Wet Wells

(1) All piping and conduits shall be adequately sealed so that no gasses can seep into dry well from wet well.

(2) Dry well requires minimum six changes of air per hour, running continuously, and 15 air changes per hour intermittent ventilation to be interlocked with the light switch.

(3) Pump Stations - Wet Well:

a) Wet wells shall be physically separated from pump area excepting submersible stations.

b) Wet well shall have a read out in inches of water.

c) Wet well shall be completely lined either with T-lock or an approved equal.

d) Wet well floor shall be sloped toward suction sump at a minimum of 1/8 inch per foot.

e) Sewage influent shall be above the high water operating level in order to allow for free flow of the gasses into the wet well.

f) In wet wells incorporating large diameter retention areas, a smaller diameter operating area shall be below the larger retention area, keeping the operating volume of sewage to minimum.

g) Wet well shall be sealed on exterior surface.

h) Wet wells shall be vented. Pump stations receiving flow from trunk sewers (18 inches or larger) shall have positive ventilation. Other pump stations may have passive ventilation.

3-304 Pivate Pump Stations

(1) All plans must be prepared to the satisfaction of the City engineer and the Director of Development Services

(2) Pump Stations plans shall include site plans, pump curves, specifications, details on elevations of influent lines, forced mains, wet-wells, storage vaults, water tables, surrounding pavement, installed underground utilities, nearby storm drains, profiles, pump head and horsepower, capacity of station, and electrical layout.

(3) Pump Stations must be constructed in a manner that they do not have a negative visual impact on the surroundings and are protected from tampering.

(4) Every pump station shall be provided with emergency storage capacity of a minimum of 6 hours at average ultimate flow. Additional storage capacity may be required by the City Engineer when a station is located up stream of a potable reservoir, the bay, a water way, or a sensitive receptor downstream.

(5) Every pump station shall be equipped with dual forced mains originating at the pumps and terminating in a gravity sewer with capacity to receive flows during peak flow periods without surcharging the gravity system.

(6) Each station shall be configured in a manner using best management practices, (BMP's) to prevent any accidental or incidental spillages or overflows of sewage, oils, treatment chemicals, etc. from directly running off into the storm drain system

(7) Each pump station shall be equipped with two separate electrical supply systems.

(8) Each pump station shall have an alarm system that will monitor all events that could lead to a station sewer overflow. This system must be able to monitor and callout response personnel on a 24 hour per day, 7 day per week basis. Response personnel must be available on the same basis and able to respond prior to an overflow event.

(9) Each station shall be equipped with a minimum of two pumps. If the capacity is enough where two pumps must run together to achieve normal flows backup pump(s) must be installed in the event of a pump failure.

(10) All electrical components must be Underwriters Laboratories or equivalent rating agency acceptable to City Engineer.

(11) Pump Station shall be designed in a manner to prevent the production of gasses that would cause corrosion to the gravity system or negatively impact the surrounding area with noxious odors.

(12) Line five sewer manholes in the gravity flow system from the point the forced main daylights to gravity flow, utilizing lining method currently approved by the City of Chula Vista for sewer manhole lining.