CHAPTER 5 – WASTEWATER COLLECTION SYSTEM

5.1 GENERAL REQUIREMENTS

A. General: This document in conjunction with City of Rio Rancho's Standard Drawings, located in the appendix, provides guidance and minimum basic design criteria and standards, as set forth by the Department of Public Infrastructure, for providing and maintaining the public sewage collection system of the City of Rio Rancho. It is intended for use in the planning and design process. Where not specified in these standards, the City Engineer or designee will specify the standards to be applied to the design and construction of public sanitary sewer improvements in order to protect the public health, safety, and welfare of all those served by the sewer system in the City of Rio Rancho.

5.2 SUBMITTALS

A. General: A design or Utility Engineering report shall be completed and submitted to the Department of Public Infrastructure, unless waived by the City Engineer or designee. The requirements and format of this report are outlined and detailed in Chapter 2 of these standards.

5.3 WASTEWATER DESIGN FLOWS

A. General: Wastewater design flows utilized in the preparation of engineering design reports, plans, and specifications shall as a minimum conform to the criteria set forth in this section. Alternate methods for determining design flows will be considered by the Utility Systems Engineer on a case by case basis.

B. Population Densities: The City of Rio Rancho uses a population equivalent of **2.78 persons/dwelling unit (DU)** for the determination of wastewater flows.

C. Average Daily Flows: Average daily flow estimates based on land development/use shall conform to Table 5.1. The average day values indicated in the table represent minimum estimates for determining design flows. Where a proposed development is known (based on specific applications and/or use), and the anticipated wastewater flows exceed the minimum

forecast demands, the greater flow shall be used to determine the design flows. Where the project land does not fit within the tabulated categories, an average daily unit flow of 210 gallons per dwelling unit per day shall be used.

Table 5.1: Average Daily Wastewater Flow Estimates

Type of Development/Land Use	Average Daily Flow
Residential	175 gpd/DU
Light Commercial	1,230 gal/ac-day
Heavy Commercial	5,968 gal/ac-day
Light Institutional	226 gal/ac-day
Heavy Institutional	1,788 gal/ac-day
Light Industrial	447 gal/ac-day
Medium Industrial	1,680 gal/ac-day
Heavy Industrial	9,266 gal/ac-day

D. Peaking Factors: All gravity sewers, lift stations, and force mains shall be designed for peak flow conditions. Peak dry weather flow is calculated as the product of the peaking factor and the average daily flow. For all sewer main diameters a peak dry weather factor of 3.0 shall be used unless otherwise approved by the Department of Public Infrastructure.

E. Wastewater Collection Main Design Flow Criteria: The following is a list of the major design flow criteria for wastewater collection lines.

1. Wastewater collection mains shall be designed to convey the peak flow.
2. Wastewater collection mains shall be designed to meet minimum slope and velocity requirements as set forth in these design standards.
3. Wastewater collection mains designs shall avoid exceeding maximum slope and velocity conditions as set forth in these design standards.
4. The peak flow shall be determined using average day flows adjusted by a peaking factor and including the allowed and any existing system infiltration or inflow.
5. Flow capacity and loading data of existing and future conditions for the City's major wastewater collection system shall be obtained from the Department of Public Infrastructure for use in designing and analyzing proposed improvements.

6. Average day and ultimate/final design flow estimates shall be well documented and shall include calculations for the following: the ultimate service area, population density, existing and anticipated wastewater flow, existing and anticipated industrial/commercial discharge, and projected infiltration/inflow.
7. Surface water, ground water, or cooling water shall not be discharged into the wastewater collection system. Prohibited connections include roof drains, storm inlets, foundation perimeter drains, area drains for open patios or driveway entrances to parking structures, and ground water sump systems.

5.4 GRAVITY SANITARY SEWER LINES – DESIGN CRITERIA

A. General: All issues and elements presented in this section are typically included and must be addressed in all wastewater infrastructure projects. The design and construction of gravity sanitary sewer mains shall conform to the design standards in this manual and Standard Drawings S-4 and S-5 in Appendix C.

B. Jurisdictional Agency Approvals: One very critical task in the early stages of the project is the development of an agency approval list. These approvals and/or close coordination required by these agencies will impact the successful and timely completion of the project. All appropriate department levels affected within the City, County, State, and Federal agencies need to be contacted for their individual requirements.

C. Environmental and Cultural Regulatory Requirements: This section is not intended to be all encompassing, rather provide an overview of the environmental and cultural requirements and the typical agency involvement. A thorough consideration of the environmental and cultural impact of the project at its specific location shall be evaluated to identify the various requirements. Private developers shall be responsible for regulatory compliance and for obtaining the required permits for their projects.

In specific areas where a project impacts Water of the United States, a Clean Water Act, Section 404 Permit shall be required from the U.S. Army Corps of Engineers.

Compliance is required with the U.S. EPA under the Stormwater National Pollutant Discharge Elimination System (NPDES) general permit for stormwater discharges from construction sites. Coverage under the general permit is required for all operators of construction sites that disturb one (1) or more acres of soil through grading, trenching, or excavation.

Projects shall not adversely impact threatened or endangered species or their habitat and shall comply with the Federal Endangered Species Act. To address any biological requirements, an assessment report of the project may be required by the U.S. Fish and Wildlife Service and the New Mexico Fish and Game Department.

Projects shall not adversely impact historic or prehistoric properties. Projects shall comply with the National Historic Preservation Act and the State Historic Preservation Act.

D. **Community Notification and Public Involvement:** The City is committed to early citizen notification and involvement. Identifying neighborhood concerns is a priority and good communication is required throughout the public involvement phase of all projects.

E. **Acceptable Pipe Materials:** The type of pipe to be installed shall comply with these standards, meet NMAPWA specifications, and shall be based upon applicable design flows, pressures, site conditions, corrosion protection, and maintenance requirements. Gravity sewer mains shall be either polyvinyl chloride pipe (PVC) or ductile iron pipe (DIP). High density polyethylene pipe (HDPE) is discussed in a subsequent section of these standards.

F. **Roughness Coefficient:** The wastewater collection system shall be designed for gravity (open channel) flow conditions, using a Manning's roughness coefficient, "n factor," of 0.011 for PVC pipe and 0.013 for DIP.

G. **Pipe Sizing:** Gravity sewer lines shall be sized to accommodate the peak design flow subject to the following limitations:

1. At the peak dry weather flow condition, the following shall be maintained for gravity sewer pipes:
   a. d/D ratio shall be no greater than 0.75
   b. q/Q ratio shall be no greater than 0.85
2. The minimum pipe size shall be 8 inches.
3. All changes in pipe size shall require a manhole at the size change. The design shall call for differing pipe sizes to match soffits at the entrance and exit of the manhole. The soffit is the bottom of the top of the pipe or the uppermost point on the inside of the structure.

H. Depth/Cover: Gravity sewer lines shall be sufficiently deep to ensure gravity drainage of service connections and avoid conflicts of service connections with water mains and dry utilities. Sewer lines shall be installed at the depth required to serve the ultimate gravity drainage area, which may include areas outside of the development project.

1. Minimum Cover: All collection mains shall have a minimum depth of cover of four (4) feet, measured from the top of the pipe to the final surface grade.
2. Shallow Cover Protection: Where collection main depths are less than four (4) feet, and the main is located under a right-of-way, street, driveway, parking lot, or areas where live loading is a concern, special pipe materials (such as ductile iron pipe) or other structural measures (such as concrete or steel encasement) shall be provided in accordance with Standard Drawing S-5 in Appendix C.
3. Provision for Basements: Proposed collection mains shall be designed with adequate depth to provide wastewater service to basements, where possible and appropriate.

I. Slope and Velocities: Sewers shall be laid with a constant and uniform slope between manholes. All changes in slope shall require a manhole at the slope change connection. Collection mains shall be designed with an adequate slope to achieve flow velocities of at least 2.0 ft/s when flowing full. Design velocities shall not exceed 10 ft/s. Table 5.2 shows the minimum and maximum slopes required in different size gravity sewer pipes.

Table 5.2: Minimum and Maximum Design Slopes

Pipe Size in inches	Minimum Design Slope %, (ft/ft)	Maximum Design Slope %, (ft/ft)
8	0.500 (0.0050)	8.50 (0.0850)
10	0.280 (0.0028)	6.25 (0.0625)
12	0.220 (0.0022)	5.00 (0.0500)
15	0.150 (0.0015)	3.75 (0.0375)
18	0.120 (0.0012)	2.80 (0.0280)
21	0.100 (0.0010)	2.40 (0.0240)
24	0.080 (0.0008)	2.00 (0.0200)
27	0.068 (0.00068)	1.70 (0.0170)
30	0.060 (0.0006)	1.50 (0.0150)
36	0.048 (0.00048)	1.15 (0.0115)

J. Alignment and Easement Requirements: The following alignment and easement requirements shall be followed for gravity sewer line designs. Note that these requirements will be different for sanitary sewers that are HDPE.

1. Sewers shall be laid with straight alignments between manholes.
2. Sewer alignment shall not meander across the street centerline.
3. Sewers shall be located in street right-of-ways and the alignments shall be parallel to property lines or street centerline, or as close as possible.
4. Sewer lines are to be located within the public right-of-way and aligned in accordance with the Utility Locations as shown in the Typical Plan View for Streets" drawings in Appendix C. Sewer lines shall be located so they can be maintained without disturbing any sidewalk, curb, gutter, structure, or any other utility.
5. If it not possible to utilize designated public right-of-way or align in accordance with the Utility Locations, alternate alignments will be considered and must be approved by the City Engineer or designee.
6. If not in a public right-of-way, the sewer line must be located in a permanent easement. A permanent easement must be granted (and dedicated to the City of Rio Rancho) for the exclusive use of sanitary sewer and water, unless shared use with other utilities is coordinated and approved in advance by the Department of Public Infrastructure. A

minimum easement width of 20 feet (or more) is required for a single utility and 25 feet (or more) for sewer and water both within the same easement.

7. Sewer and water easements shall be free of all obstructions and shall at all times be accessible to City service equipment. No buildings, sport courts, walls, fences, shade structures, nor permanent structures of any kind shall be constructed upon, over, or under and water/sewer line easements. No landscaping shall be placed and/or planted within the easement that would render the easement inaccessible by equipment. The Utilities Division has the right to have any obstruction removed without notice to the property owner and all cost associated with the removal shall be the property owner's responsibility. The maintenance of all landscaping in sewer line easements is the responsibility of the property owner.

K. Sewer Main Connections at Manholes: Gravity sewer main connections (not services) at a manhole are described as the upstream pipe connection, the downstream pipe connection, and the intersecting pipe connections. Gravity sewer main connections shall be in accordance with Standard Drawings S-3, S-10, and S-15 in Appendix C. There shall be no more than four main connections at a manhole.

Flow will not be permitted to change horizontal flow direction by more than 90 degrees in a manhole. Under the following conditions, the maximum horizontal change in flow direction permitted will be 50 degrees although special design considerations will be made where the situation warrants:

1. All lines larger than 36 inches.
2. Any lines with design flow greater than 3.0 MGD and a design velocity of 5.0 ft/s or greater.
3. Any junction of two flows, each with design flow greater than 3.0 MGD, where one line has a design pipe velocity of 5.0 ft/s or greater.

The upstream pipe shall be the same or smaller diameter than the downstream pipe. The design shall call for differing pipe sizes to match soffits at the entrance and exit of the manhole.

Where onsite sewage collection systems from developments connect to mains on arterial streets, the invert of the intersecting pipe should be at or above the crown elevation of the downstream pipe. Intersecting pipes shall be of equal or smaller diameter than the downstream pipe.

In all cases, the invert of the downstream pipe shall be at least 0.1 feet lower than the invert of the upstream pipes and intersecting pipes and shall be low enough to maintain the energy gradient across the manhole.

L. **Cross Connections:** There shall be no physical connections between a public or private potable water supply system or storm drainage system and a sanitary sewer, or appurtenance thereto which would permit the passage of any wastewater or polluted water into the potable supply or storm drainage system. No water pipe shall pass through or come into contact with any part of a sanitary sewer manhole.

M. **Separation from Water Mains:** To minimize the potential for cross contamination, gravity sanitary sewer mains and force mains shall be laid at least 10 feet horizontally from any existing or proposed water line. In situations where it is not feasible to maintain a 10-foot separation the design engineer may propose a reduced distance. Such reductions may only be approved and granted by the City Engineer or designee and may be allowed provided the sewer main is laid in a separate trench or an undisturbed earth shelf located on one side of the water line at an elevation so that the bottom of the water main is at least 18 inches above the top of the sewer line.

Gravity sanitary sewer mains and force mains crossing water lines should be laid to provide a minimum separation of 18 inches between the outside of the sewer main and outside of the water line. This separation should be maintained where the sewer main is either above or below the water line. The crossing should be arranged so that the water main joints will be equidistant and as far as possible from the sewer line.

Where it is impracticable to obtain proper horizontal and vertical separation, the sewer line should be designed and constructed equal to the water main and should be pressure tested to

assure watertightness. Encasement of the water line may also be required by the City Engineer or designee in accordance with Standard Drawing S-5 in Appendix C.

N. **Separation from Storm Drains and Culverts:** Sewer mains shall maintain six (6) feet horizontal and two (2) feet vertical separation from storm drains and culverts as measured between the crown of the lower and invert of the upper. Sewer lines crossing less than two (2) feet below a storm drain or culvert will require pipe encasement. Whenever possible, the sanitary sewer should be placed below the storm sewer.

O. **Separation from Other Utilities:** Sewer mains shall maintain a minimum six (6) feet horizontal separation and two (2) feet vertical separation to any underground utility, all measurements outside to outside.

P. **Locator Tape and Tracer Wire:** Install detectable marking tape continuous over the top of the pipe. The marking tape shall be buried eighteen (18) inches over the top of the buried force main. 12 gage tracer wire shall also be buried along with the pipe.

Q. **Buoyancy:** Buoyancy of sewers shall be considered and flotation of the pipe shall be prevented with appropriate construction where high groundwater conditions are anticipated.

R. **Trenching, Bedding, and Backfill:** Trenching, bedding, and backfill for shall conform to NMAPWA standards and Standard Drawing S-4 in Appendix C.

S. **Testing Procedures:** Air testing, exfiltration testing, vertical deflection testing, and televising of sanitary sewer pipes shall follow and adhere to the requirements and protocols as outlined in the NMAPWA specifications.

5.5 MANHOLES – DESIGN CRITERIA

A. **General:** The design and construction of gravity sanitary manholes shall conform to the design standards in this manual and Standard Drawings S-1, S-2, and S-3 in Appendix C.

B. Manhole Locations: Manholes shall be installed at the following locations:

1. Changes of grade or slope
2. Changes of pipe size
3. Changes of horizontal or vertical alignment
4. Changes in pipe material
5. Pipe intersections except with service connections less than 8-inches in diameter
6. Service connections 8-inches in diameter and larger
7. The end of each public sewer line
8. At distances not to exceed the spacing shown below

Where feasible, manholes are to be installed at street intersections. Manholes should also be located outside of bike lanes, sidewalks, or multi-use paths whenever possible. Manholes shall not be located in areas subject to immersion during storm events, such as gutters and ponding areas.

Direct access by maintenance vehicles shall be provided to each manhole. The access drive shall be a minimum of 10 feet in width and shall be an all-weather surface, such as asphalt or concrete paving, or adequate gravel base and shall be capable of supporting maintenance vehicles weighing up to 14 tons.

C. Manhole Spacing: Manholes shall be required along collection mains at distances not greater than the maximum manhole spacing as shown in Table 5.3 below.

Table 5.3: Maximum Manhole Spacing

Pipe Size (inches)	Maximum Manhole Spacing (feet)
$\leq$ 21	450
$\geq$ 24	500

D. Manhole Diameter: The minimum manhole diameters and standard frame and cover sizes for various pipe sizes are shown in Table 5.4 below.

Table 5.4: Minimum Manhole Diameters

Pipe Diameter (inches)	Manhole Depth (feet)	Minimum Manhole Diameter (inches)	Minimum Frame and Cover Diameter (inches)
≤ 15	≤ 12	48	30
≤ 15	> 12	72	30
> 15	any	72	30

E. **Clean Outs:** Shall conform to the design standards within this manual and Standard Drawing S-12 in Appendix C. Clean outs are not permitted on mains.

F. **Manhole Stub Outs:** Manholes on the boundaries of subdivisions and at other locations directed by the City Engineer or designee shall include full line size stubs with shaped inverts, oriented to accommodate future connections or extensions. All 20-foot stub outs shall be plugged.

G. **Manhole Separation from Water Mains:** No water pipe shall pass through or come into contact with any part of a sewer manhole or connection structure.

H. **Drop Manholes:** Drop manholes shall be required where the invert of the upstream pipe section entering the manhole is greater than two (2) feet above the invert of the downstream pipe section exiting the manhole. Drop manholes shall be designed and constructed in accordance with Standard Drawing S-10 in Appendix C.

I. **Flow Channel:** Flow channels shall be required in all manholes, connecting the inverts of the upstream and downstream pipe sections. The flow channel straight through a manhole shall be made to conform as closely as possible in shape, and slope to that of the connecting sewers. Flow channel height and slope requirements are shown in Tables 5.5 and 5.6 below.

Table 5.5: Minimum Flow Channel Heights

Pipe Diameter (inches)	Minimum Flow Channel Heights
< 15	½ of the pipe diameter (to pipe centerline)
> 15	¾ of the pipe diameter

Table 5.6: Minimum Flow Channel Slopes

Type of Manhole/Flow Channel	Minimum Flow Channel Slope
Manholes on continuous slope, straight alignment pipe lines	2.5% slope from entrance to exit
Manholes at changes in pipe size	Match soffits at entrance and exit of manhole

J. **Bench:** A bench shall be provided on each side of any manhole channel when the pipe diameter(s) are less than the manhole diameter. The bench shall be sloped to provide a minimum 3-inch fall from the top of the bench to the crown of the pipe or one-half inch per foot (1/2”/ft), whichever is greater. No lateral sewer, service connection, or drop manhole pipe shall discharge onto the surface of the bench. Refer to Standard Drawing S-3.

K. **Water Tightness:** Manholes shall be of the pre-cast concrete or cast-in-place concrete type. Manhole lift holes and grade adjustment rings shall be sealed with non-shrinking mortar. Inlet and outlet pipes shall be joined to the manhole with a gasketed flexible watertight connection or any watertight connection arrangement that allows differential settlement of the pipe and manhole wall to take place. Refer to Standard Drawing S-3.

L. **Covers:** Where manholes must be located within the 100-year floodplain, or in a location where runoff may accumulate and pond, the manhole shall be installed with a watertight, bolting-type cover to prevent inflow/outflow. The manhole ring shall be bolted to the manhole cone to prevent possible damage due to surcharge. Locked manhole covers with bolting-type covers may be desirable in isolated easement locations or where vandalism may be a problem. Manhole frames and covers shall be designed and constructed in accordance with Standard Drawings S-1 and S-2 in Appendix C.

M. **Testing:** Manholes shall be tested for leakage in accordance with NMAPWA specifications.

N. **Corrosion Protection for Manholes:** Where corrosive conditions due to septicity or other causes are anticipated, consideration shall be given to providing corrosion protection on the interior of the manholes.

5.6 SERVICE CONNECTIONS

A. General: Service connections to the City of Rio Rancho wastewater system shall conform to Article 51.08 of Chapter 51 of the Rio Rancho Code of Ordinances and Standard Drawings S-6, S-7, and S-8 in Appendix C.

B. Taps: Wastewater service connections to newly constructed collection mains shall require the installation of a tee or wye, in conformance with these standards. A directional fitting shall be used at all tap connections.

C. Separate Service to Lots: All platted lots, whether existing or proposed as part of a subdivision, shall front on and have a separate wastewater service connection to a collection main without crossing adjacent lots.

D. Service Alignment: Wastewater services shall be installed perpendicular to the collection main, for that portion of the service line that is located in the public right-of-way or easement. Where this is not possible, the wastewater service alignment shall be subject to determination by the City Engineer or designee.

E. Service Connection Sizes: Table 5.7 below shows the service connection sizes based on the development type.

Table 5.7: Service Connection Sizes

Development Type	Service Connection Size (inches)
Residential Lots	4 or 6
Commercial Lots	Minimum 6
Multiple Family Lots	Minimum 6
Industrial Lots	Minimum 6

F. Separation from Water Service: Wastewater services shall maintain a minimum horizontal separation of ten (10) feet from water services.

G. **Maximum Main Size for Taps:** Service connections shall not be directly made into sewer mains 30-inches in diameter and larger. Service connections shall require a minimum 8-inch public sewer main extension, which shall be constructed from the nearest downstream manhole to the point of service.

H. **Prohibited Connections:** No surface water or ground water, may be discharged into the wastewater service. Prohibited connections include roof drains, storm inlets, foundation perimeter drains, area drains for open patios or driveway entrances to parking structures, and ground water sump systems.

I. **Manhole Connections:** Service connections to manholes shall be avoided, except where:

1. The service size is 8 inches in diameter or larger (which requires the installation of a manhole);
2. The service connection is tied to a terminal manhole, located at the end of a cul-de-sac or easement, and there is no possibility of extending the collection main in the future;
3. The service connection elevation cannot be tapped above the springline of the sanitary main.

J. **Service Connection Installation:** Service connections to the sewer main shall be watertight and not protrude into the sewer. Saddle type connections shall not be used. All materials used to make service connections shall be compatible with each other and with pipe materials to be joined and shall be corrosion proof.

Normally taps extend at right angles to the main. When a tap is made at a manhole the tap may be installed at an angle to the main providing the installation does not restrict flow. The invert of the service connection shall be at or above the crown of the sewer main.

5.7 WASTEWATER LIFT STATIONS

A. **General:** Shall be designed according to the NMED, Construction Programs Bureau, "Recommended Standards for Wastewater Facilities, 2003 Edition (or latest version)."

B. Design Analysis Report (DAR): In addition to meeting the requirements set forth in the "Recommended Standards for Wastewater Facilities, 2003 Edition", the design engineer shall submit a DAR to the City of Rio Rancho, Utility Department, for review.

1. Table 5.8 summarizes the minimum requirements of a lift station DAR.

Table 5.8: Lift Station DAR Requirements

Item	Description
1.	Average Influent Station Flow, gpm
2.	Peaking Factor
3.	Wet Well Volume, gallons and cubic feet
4.	Average Flow Fill Time, minutes
5.	Peak Flow Fill Time, minutes
6.	Diameter of Proposed Force Main, inches
7.	Velocity in the forcemain under normal operating conditions (if multiple pumps are used, velocity for each multiple pump operation condition should be shown)
8.	Pump and System Curve with Duty Point, including the Duty Point for parallel pump operation if applicable.
9.	Pump Time based on Average Flow, minutes
10.	Pump Time based on Peak Flow, minutes
11.	Number of Pump Cycles per Hour
12.	Surge Analysis and Recommendations
13.	4 floats – "stop", "lead", "lag", and "high"
14.	Grading and Drainage Plan – Slope site for accessibility of a vactor truck (<3%)
15.	Instrumentation and Control considerations including SCADA, alarms, etc. Provide a transducer with digi-gauge output to SCADA
16.	Site Layout including emergency generator (ATS) location and overflow prevention location, a 12-foot all weather access road, and a security fence with a 14-foot wide rolling gate for service vehicles.

2. All new lift stations shall be provided with an on-site, permanently installed, emergency generator sized to provide emergency electrical service to the site. Calculations justifying the size of the generator shall be provided. In addition the lift station shall have a spare pump and site lighting.

5.8 FORCE MAINS

A. General: All force mains shall be designed according to the NMED, Construction Programs Bureau, "Recommended Standards for Wastewater Facilities, 2003 Edition (or latest version)."

B. Cleanouts: Cleanouts will be installed at a maximum spacing of every five hundred (500) feet or not to exceed a volume of wastewater over three thousand (3,000) gallons between cleanouts. Special consideration will be given to cleanout spacing where the required force main diameter is larger than twelve (12) inches. The cleanouts will be constructed in accordance with the City of Rio Rancho Standard Drawing S-13, unless otherwise specified by the City of Rio Rancho City Engineer or designee.

C. Locator Tape and Tracer Wire: Install detectable marking tape continuous over the top of the pipe. The marking tape shall be buried eighteen (18) inches over the top of the buried force main. 12 gage tracer wire shall also be buried along with the pipe.

D. Leakage Testing: All force mains within the City of Rio Rancho wastewater service area shall be hydrostatic tested at a minimum of fifty (50) psi above the design working pressure.