THE METROPOLITAN SEWERAGE DISTRICT
OF BUNCOMBE COUNTY, NORTH CAROLINA
DESIGN CRITERIA

STANDARDS: For all systems or services designing connection to any system connected to the existing public collection system shall be that they are designed to remain water tight such that stormwater and groundwater are not allowed to enter the system.

MINIMUM LINE SIZES for a single family service shall be 4-inches. Six inch collection lines serving two or more facilities are allowed for "Private Collection Systems" but minimum eight inch collection lines are required for "Extensions of the Existing Public Collection System". Actual line sizes shall be designed to carry the "Peak Sanitary Flow" at not more than one half full pipe capacity.

PEAK SANITARY FLOWS shall be calculated based on combined Peak Industrial/Commercial Flows, Infiltration, Inflow, Peak pump station discharges, peak residential discharge, and "Potential Growth" of entire natural drainage basin.

POTENTIAL GROWTH shall include flow calculations based on NCDENRDWQ's Unit Contributory Loadings for existing structures and flow from possible development per existing zoning, or eight (8) people per acre where zoning does not exist.

RESIDENTIAL FLOWS shall be based on 100 gallons per day per capita with a peak hourly flow rate peaking factor based on:

$$\text{Peak Factor} = \frac{18 + \sqrt{P}}{4 + \sqrt{P}}$$

Where P is the population served expressed in thousands.
(Minimum allowable peak factor is 2.5)

BACKFLOW PREVENTERS are required as per North Carolina Plumbing Code.

CONNECTION TO THE EXISTING SYSTEM must conform to all Federal, State, Local and Metropolitan Sewerage District's ordinances and requirements.

CONTENT OF THE EFFLUENT shall not exceed the parameters of that to be expected from domestic flows or a pretreatment permit must be obtained.

MINIMUM COVER for all collection system lines must be three feet or ductile iron pipe is required.

MAXIMUM COVER shall not exceed those specified by MSD Trench Details.

LOADINGS: Over all collection system lines and appurtenances shall be designed to the proposed conditions.

DEVELOPED PROPERTY requiring connection to the existing system shall not limit access of upstream off-site properties to the existing system. The Developer requiring connection shall dedicate appropriate easements compatible with the present and future needs of the public to MSD. Any system constructed within this easement shall be constructed as an "Extension of the Existing Public Collection System".

MSD PLAN CHECKLIST REQUIREMENTS shall be complied with wherever possible. Any item which cannot be complied with must be described by the Engineer and approved by MSD.

Extensions, Replacements, or Repairs on Private Collection Systems

The District Discourages the Construction of Private Collection Systems

PRIVATE COLLECTION SYSTEMS shall be designed and installed in strict accordance with the requirements of North Carolina Plumbing Code, North Carolina Division of Environmental Management, and additional MSD requirements. In addition these systems shall require that a "Non-Discharge" Permit be issued. All Private Collection Systems require approval of MSD prior to submittal to NCDWQ for a "Non-Discharge" Permit. These systems must also have an approved "Operation Agreement" provided to MSD upon application.

CLEAN-OUT: Spacing and location for "Private Collection Systems" are dictated by the North Carolina Plumbing Code. "Private Collection Systems" must have a manhole located at the point of connection to the "Existing Public Collection System".

MATERIALS & INSTALLATION are to be those materials approved by MSD (without regard to pipe size). Installation of pipe, manholes and appurtenances shall be in strict accordance with the requirements of the manufacture, NCDWQ, and those specifically required by MSD to insure a system that remains water tight.

Extensions, Replacements, or Repairs on the Public Collection System

EXTENSIONS OF THE EXISTING PUBLIC COLLECTION SYSTEM shall be designed and installed in strict accordance with the requirements of MSD and require that a "Non-Discharge" Permit be issued. Extensions of the Existing Public Collection System" must be located within seventy-five (75) feet of each property served. Extensions of the "Existing Public Collection System" which will occupy subdivision public street or road rights-of-way within Asheville and unincorporated areas of Buncombe County shall be designed and installed in strict accordance with the **MSD DETAIL "USE OF PUBLIC RIGHTS-OF-WAY"** or variances satisfying the District's Minimum Utility Separation requirements shall be approved on a case by case basis. Where sewers are installed in Rights-of-Way which do not provide one half the required permanent easement width on each side of the pipe centerline, variances shall be approved on a case by case basis.

EASEMENT WIDTHS - See ROW section of this book for required easement widths.

MATERIAL & INSTALLATION for "Extensions of the Existing Public Collection Systems" are to be those approved by MSD and listed in the District Material Specifications for Sanitary Sewer Construction.

DEPTH of all Extensions of the Existing Systems" shall be designed to provide gravity service for each lot served. Depth will be such that each service line will be able to cross streams or creeks with a minimum of one foot of cover.

MAXIMUM SLOPE for DIP sewers without anchors shall be 20 percent grade. For DIP sewers installed at slopes exceeding 20 percent grade Anchors are required: every 36-feet for slopes 21% to 35%, every 24-feet for slopes 36% to 50%, and every 16-feet for slopes exceeding 50% grade. No PVC

pipe for slopes over 20%.

MINIMUM VELOCITY shall be 2-feet per second at current design residential flow, 1/2 pipe flow or whichever is greater.

MANHOLES are required on all eight inch and larger lines. They are required at the end of the collection system, at the tie to the existing collection system, at each change in line size, at each change in direction, at each change in grade, at intersections of collection systems, at each 8-inch or larger service line, and at separation distances of no greater than four hundred feet.

EXTERNAL DROP MANHOLES will only be approved to address utility conflicts or unusual situations. The minimum vertical drop shall be thirty six (36") inches.

DEFLECTION ANGLES greater than ninety degrees (90°) require special District approval. Approved manhole inverts which exceed 90° deflection shall be precast.

MANHOLE INVERTS shall be filleted to prevent solid deposits. The fall across the manhole for all pipes will be equal to the average of the grades through the manhole. However when grades are less 5.0 percent, 8-inch sewers shall have a minimum elevation difference of 0.20 feet. When grades are less than 5.0 percent, 10-inch to 15-inch diameter sewers should have a fall of 0.20 feet if practical. Pipe grades shown shall be based on actual distance and elevation changes between manhole invert out and downstream invert in. For all sewers less than or equal to 42-inches in diameter each pipe invert will be shown on construction plans.

SERVICE LINE CLEAN-OUTS are required for all service lines which are connected to "Extensions of the Existing Public Collection System" and must be located at the edge of the public Right-of-Way or MSD Easement.

SERVICE LINES shall be provided for each developable lot.

FLOOD PRONE AREAS: One hundred year flood elevation shall have collection systems that are sealed and vented to an elevation of two feet above the flood elevation. Manholes shall have locking, watertight rings and covers. Vents are to be provided to insure adequate operation and maintenance.

STREAM BUFFERS are required for all sewer systems paralleling streams or creeks. Sewer mains shall be located no closer than 10-feet from stable creek or stream banks and no closer than 25-feet from stable banks of designated trout streams (provided that all required sedimentation control can be maintained within the above mentioned buffer).

STREAM/CREEK CROSSINGS require that ductile iron pipe be used. The ductile iron pipe shall be a minimum of one foot below the stable invert of the stream. Additional depth may be required for unstable channels along with encasement. All disturbed banks are to be stabilized to a minimum of 10-feet from the area of disturbance. All crossings are to be made as nearly perpendicular to streams as practical. Submittal of copies of any required State, Federal, or Local permits is required.

AERIAL STREAM CROSSINGS shall meet all requirements except depth as listed for Stream/Creek Crossings and shall be approved on a case by case basis. Joints are to be supported and securely anchored (using methods approved by MSD) at an elevation 1-foot above the fifty year storm flows for

drainage areas less than one square mile and 1-foot above the one-hundred year storm for drainage areas greater than one square mile. Submittal of flood elevation documentation is required.

UTILITY CROSSING clearance requirements are to be met or ferrous sewer pipe with joints equivalent to water main standards will be used for a distance of 10-feet outside said point of crossing.

Storm Sewers	18-inches Vertical	
Water	18-inches Vertical	(Sewer over water requires that both pipes shall be ferrous pipe with a 20-foot jointless span centered at crossing).
Power	18-inches Vertical	
Gas	18-inches Vertical	
Cable	18-inches Vertical	
Benched Vertical	18-inches	

Top slope of embankment or cuts of 2 feet or more vertical height – 10 feet

MINIMUM SEPARATION distances from all Sewer Collection Systems are to be met or ferrous sewer pipe with joints equivalent to water main standards will be used.

Storm Sewers	5-feet Horizontal	
Water Mains	10-feet Horizontal	
Water Supply	100-feet Horizontal	(Class I or Class II impounded reservoirs).
Water Supply	50-feet Horizontal	(WS-II, WS-III, WS-IV, WS-V, B, SA, or SB Waters - Natural High Water)
Other Stream, Lake or Impoundment	10-feet Horizontal	
Designated Trout Streams	25-feet Horizontal	
Building Foundations	5-feet Horizontal	
Basement	10-feet Horizontal	
Ground Water Lowering and Surface Drainage Ditch	10-feet Horizontal	
Swimming Pool	10-feet Horizontal	
Interception Drains	10-feet Horizontal	

NOTE: Absolute Minimum separation from Private Wells - 25-feet, Public Wells - 50-feet. The maximum separation for vented manholes shall be 1000 feet for line sections not vented by service tap.

ADDITIONAL MINIMUM HORIZONTAL UTILITY SEPARATION: Distances for "Extensions of the Existing Public Collection System" which are installed inside easements or existing public rights-of-way are to be 2-feet plus one-half foot every 1-foot of vertical separation. Both horizontal and vertical separations are to be measured from outside edge of utility conduits. For separations from building foundations, basements, and swimming pools, vertical separation distances will be based on difference in

surface elevation and sewer invert elevation. Fiber Optic Cable separations require case by case review whenever the lines are to be within twenty feet (20-feet) of Extensions of the Existing Public Collection System".

PUMP STATIONS AND FORCE MAINS: The Pump Station must be designed to serve "Peak Sanitary Flows". Use of pumps which would be operating at a point near the limits of the operational curve require a written recommendation from the manufacturer is required stating that the pump will not require unusually high maintenance as a result of the proposed conditions. Force Mains shall be sized at no less than 4-inches in diameter for submersible pumps or 2-inches for pumps under 5 horsepower. No fittings shall be allowed which exceed 45 degrees. Force Main velocities shall be maintained at no less than 2.0 feet per second (no less than 79 gpm for 4-inch force mains, or 20 gpm for 2-inch force mains). System curves/pumps shall utilize "C" factor of 100. Pumps shall be rated for higher horsepower required during initial high "C" factor of 130. Pumps shall be capable of handling suggested values (varies approximately 2.5 minutes) are maintained with approximately 7 to 12 minutes as the minimum off time between cycles. In addition, wet wells will be sized so that filling time is no greater than 30 minutes during average daily flows. Provision will be made for adjusting float controls to accommodate initial project startup and development. Pump Stations shall have an access road with eight inches of compacted BBC. When slope of access roads exceeds 10%, the road surface shall be paved with no less than 2-inches of compacted bituminous surface. Access road shall allow passage of any District Vehicle. District will review each site to determine if truck turn around is required. Pump Stations and all appurtenances shall be built within an approved exclusive District easement.

FORCE MAINS shall have air release valves at all high points were elevation difference exceeds 10-feet.

PUMP STATION REIMBURSEMENT FEES shall be equal to the cost of replacement pumps and panel plus the present worth value of the phone and electrical service for 20 years.

PUMP STATION MAINTENANCE FEE: A cost evaluation shall be performed by the developer to compare the construction, operation and maintenance expenses involved in a pump station and force main versus a gravity system designed to serve the project. If the developer chooses to install a pump station and force main in order to experience a reduction in the development costs, or for other reasons, and give the system to MSD for ownership and maintenance, a one-time lump sum fee shall be paid to MSD by the developer of such a system to pay for the difference in the construction, operation and maintenance costs of the pump station throughout its lifetime compared to that of a gravity system.

Items which must be included when considering the operation and maintenance cost of a pump station which will be accepted by the District are monthly utility bills (including power, telephone and emergency power generation, labor and mileage to monitor the condition of a station on a regular basis (1 or 2 times per week), all anticipated labor, parts, materials and equipment, and all other reasonable costs anticipated to properly operate and maintain the facility throughout its expected useful lifetime of approximately twenty years.

Calculation of this fee shall be based on the present value determination of all anticipated costs, including the application of a reasonably anticipated rate of inflation to all utility charges, equipment, labor, parts and materials necessary for proper operation and maintenance of the facility and a projected rate of return on the invested lump sum fee.