SECTION 600 - INSPECTION, TESTING AND ACCEPTANCE

601. INSPECTION

1.) Inspection will be done by the Cherokee County Water and Sewerage Authority. Inspections will be scheduled as received by the Authority. The Authority must be notified four (4) days prior to any construction.

2.) The Chief Inspector shall be notified when specific inspections are required so that the inspection time can be scheduled.

3.) The Contractor shall present the following when requesting a final project inspection:

- **a.)** The size and length of all lines installed including services.
- **b.)** A completed Project Information Form (Exhibit B). (See form at end of Section 600.)
- **c.)** As-built plans and electronic data prepared in accordance with the requirements set forth in Section 604.

4.) In no circumstances shall any buildings and/or plumbing fixtures be connected to the line until inspected and approved by the Authority.

5.) Upon request, the contractor shall furnish the Inspector with appropriate copies of the manufacturer's certification that the materials to be used meet the materials requirements of these specifications. The Inspector may reject any materials not meeting specifications or any faulty or damaged materials. Any materials so rejected must be removed from the project immediately and must be prominently marked so that they can be spotted on this or any other project.

6.) Authorized representatives of the Cherokee County Water and Sewerage Authority, which may include appropriate county, state or federal agencies, shall have access to the site for inspection at any time.

7.) The Chief Inspector shall be notified by 8:30 a.m. of each workday when work is scheduled unless authorized otherwise.

8.) The Chief Inspector may at any time direct that he be allowed to see any foundation, bedding, pipe work, manhole or other appurtenance. If the Chief Inspector so directs, all pipe work shall be left open until the Inspector views

the work. The trench may be backfilled with the approval of the Inspector if the work is not inspected by the close of the working day. No connections to manholes, nor wyes, bends, service laterals, nor service stoppers shall be backfilled without the approval of the Inspector.

9.) The contractor shall complete the project and shall have cleaned up the job site prior to requesting a final project inspection. The Chief Inspector may terminate the inspection and direct further work at any time he feels that the project is not substantially complete and ready for inspection. Manholes and lines shall be clean and free of all mud and debris at the time of inspection. The Contractor shall furnish adequate personnel to open manholes and give whatever other assistance is needed by the Chief Inspector.

10.) The representative of the Chief Inspector will normally visually inspect all manholes and lines for conformance to the specifications and will check the measurements shown on the "As-Builts" for accuracy. The representative may perform low pressure air test to insure all lines are sealed. Any of the following tests may also be required at the discretion of the Inspector:

i.) Measurement of infiltration
ii.) Smoke test
iii.) Mandrel test
iv.) Velocity test
v.) T.V. inspection
vi.) Compaction test
vii.) Ball Test
viii.) Force Main Pressure and Leakage Test

Any defects found by these tests must be corrected before construction of the project may proceed.

11.) A punch list shall be issued for corrective work if needed. However, the Chief Inspector shall not perform the contractor's work by finding all of his problems before the project is reasonably complete.

602. SANITARY SEWER SYSTEM TESTING

1.) GENERAL

All sanitary sewer lines, including both gravity sewers and force mains, shall be successfully tested before being eligible for acceptance by the Authority. Any of the following tests may be run at the discretion of the Chief Inspector. All sewer

mains shall also be subject to the material-specific tests listed in Section 400, “Materials for Sanitary Sewers”, under each type of pipe material acceptable for sanitary sewers.

2.) LOW PRESSURE AIR TEST

After completing backfill of a sewer line section, conduct a low pressure air test of all pipe constructed, using methods and devices acceptable to the Authority. Perform such tests using the following general procedures:

i.) Temporarily plug line segment between two manholes using plugs having air tight fittings through which low pressure air can be introduced into the pipe segment being tested.

ii.) Introduce low pressure air into the test pipe segment until the internal air pressure reaches 4.5 psig above ground water pressure, if any.

iii.) Wait at least two minutes for air temperature in the test segment to stabilize while internal air pressure remains no less than 3.5 psig above ground water pressure.

iv.) Bleed internal air pressure to exactly 3.5 psig above ground water pressure.

v.) Accurately determine the elapsed time for internal pressure to drop to 2.5 psig above ground water pressure.

vi.) The air test is acceptable if elapsed time is no less than shown by the following table:

Pipe Dia. Inches	Seconds Per 100 Ft. of Pipe	Pipe Dia. Inches	Seconds Per 100 Ft. of Pipe
4	11	27	77
6	17	30	85
8	23	36	102
10	28	42	119
12	34	48	136
15	43	54	153
18	51	60	170
21	60	66	187

24	68	72	204

Air leakage time is based on pipe being damp. If pipe and joints are dry, dampen line if helpful in meeting air test time requirement.

Permanently correct excessive leakage determined by air testing, and repeat operations until Inspector witnesses a successful test on each line segment; then remove nipple through manhole wall without disturbing adjacent grout. Permanently caulk resulting hole watertight.

3.) MEASUREMENT OF INFILTRATION

The contractor shall furnish an adequate number of plugs of the proper size and acceptable weirs to measure infiltration into the system.

Measurements of flow shall be performed on any lines with a visible flow of water. In no case will an infiltration rate greater than 25 gallons per inch diameter of pipe per mile of sewer per day be allowed. All visible or audible leaks must be dug up and repaired unless it is found to be in a joint and can be repaired by chemical grouting. The testing procedure shall be in accordance with ASTM C 1091 or ASTM C 969 and shall generally include the following:

i.) Plug the upper (inlet) end of the test section including laterals.

ii.) At the lower (outlet) end, collect the water and measure the quantity collected within a specific time in a calibrated container after a constant flow is generated at the pipe section outlet.

iii.) An alternate measurement method is to use a calibrated weir installed at the outlet.

4.) SMOKE TEST

Smoke tests show infiltration/exfiltration sources by blowing artificial smoke through the sewer line with a blower designed to sit on the manhole and push air through the lines so that the smoke exits the line through cracks and holes in the line and/or manholes. Sections of line are tested individually by blocking off other line sections with sandbags or line plugs. The local fire department shall be notified prior to any smoke testing.

5.) MANDREL TEST

The mandrel test shall be performed in accordance with the following procedure for testing sewer pipe for maximum allowable deflection:

A.) Completely flush the line making sure the pipe is clean of any mud or trash that would hinder the passage of the mandrel.

B.) During the final flushing of the line, attach a floating block or ball to the end of the mandrel pull rope and float the rope through the line. (A nylon ski rope is recommended).

C.) After the rope is threaded through the sewer line, connect the pull rope to the mandrel and place the mandrel in the entrance of the pipe.

D.) Connect a second rope to the back of the mandrel. This will enable the mandrel to be retrieved if excessive deflection is encountered.

E.) Remove all the slack in the pull rope by gently pulling the rope at the far manhole. After the slack has been removed, place a tape marker on the rope, close to the pipe opening where the mandrel will exit. If mandrel encounters excessive deflection, the marker will provide a means of measuring the travel distance of the mandrel so that the deflected area can be located.

F.) Pull mandrel through the sewer line.

G.) An increasing resistance to pull is an indication of excessive deflection. If this occurs measure the distance from beginning marker on rope to manhole. Locate section and replace bedding or pipe if visual examination reveals damage.

H.) Retest until acceptable.

6.) VELOCITY TEST

On lines installed at minimum grade and at any time the Inspector suspects that a problem with flow will occur, a velocity test of the suspected section may be required.

The contractor will add sufficient water at a point upstream of the suspect

section. After flow has reached a steady state, dye or some type of floating object such as a ping pong ball or fishing float will be passed through the line.

The float will be timed as it passes through the section. Any line in which a velocity of 2.0 feet per second cannot be obtained will not be acceptable.

7.) T.V. INSPECTION

All sewer lines shall be televised and a film of the inspection made before the final plat is signed and again before the final acceptance of the sewer lines. The films may be stored on VHS or DVD. Prior to televising the mains, the mains shall be flushed with water so that sags are apparent. The mains shall be televised in segments identified by the approved manhole ID numbers (See Section 604.2). The manhole numbers shall be the same as those assigned by the Authority on the stamped plans.

Any faulty pipe noted such as sagged pipes, broken pipes, bad joints, etc., will be dug up and will be corrected. Internal grouting to repair new lines will not be allowed. After correction of the discrepancies, the line will be re-televised.

8.) COMPACTION TEST

All trenches shall be subject to compaction testing after backfilling and shall meet the compaction requirements set forth in Section 509. All trenches failing to meet compaction requirements shall be excavated and recompacted and retested. This process shall continue until a passing test is achieved. All costs of compaction testing shall be the responsibility of the Developer.

9.) BALL TEST

Procedure for Ball Test:

A.) Clean lines.
B.) Place ball that is not more than 1/2" in diameter less than diameter of pipe to be tested in the end of section to be tested. Example: Ball not less than 7-1/2" in diameter for test of 8" diameter pipe.
C.) Ball should travel freely through the section being tested.

10.) FORCE MAIN PRESSURE AND LEAKAGE TEST

A.) After all piping has been placed, the main shall be tested by the

Developer's Contractor in the presence of the Chief Inspector or his designated representative and tests shall be continued until all leaks have been made tight to the satisfaction of the Authority. The Contractor shall furnish all necessary meters, pumps, gauges, bulkheads, and other materials and appliances necessary to conduct the test as herein required. Every precaution must be taken to valve-off or otherwise protect control equipment in or attached to the pipe line to prevent damage thereto.

B.) Before applying the specified test pressure, all air shall be expelled from the pipe. If air release valves are not available at the high places, the Contractor shall make the necessary taps at points of highest elevation before the test is made and insert plugs before the test has been completed.

C.) Prior to the pressure test, pipe laid in trenches shall be backfilled adequately to secure the pipe during the test. Any observed leakage shall require corrective measures to pipe lines and/or joints to the satisfaction of the Inspector.

D.) The Authority will furnish the necessary water for the testing of the force mains; however, any water lost through breakage of lines or unnecessary or excessive flushing of lines will be charged to the Contractor at the current residential rate. All lines shall be tested to a pressure of 200 PSI. Test duration shall be two (2) hours. However, test pressure shall not exceed pipe, valve and/or thrust-restraint design pressures. Test pressure shall not vary by more than $\pm$ 5 psi for the duration of the test which may require periodic pumping (in which case the added water will be counted as part of the leakage). The rate of leakage shall not exceed 15 gallons per 24 hours per inch diameter per mile of force main. (See Table below.)

LEAKAGE TABULATION

SIZE OF PIPE	GALLONS/HOUR/100 FT.	GALLONS/DAY/100 FT.
16"	.189	4.545
12"	.142	3.409
10"	.118	2.841
8"	.095	2.273
6"	.071	1.705
4”	.047	1.136
3”	.035	0.846

Any section of the line not meeting the above test shall have the leaks found and corrected at once and re-tested until the leakage falls within the limits specified above. Leakage testing must be witnessed and approved by the Authority.

603. ACCEPTANCE

1.) The Cherokee County Water and Sewerage Authority may issue a conditional approval letter certifying the completion of the sanitary sewer system when the contractor has completed the work items shown on the plans to the satisfaction of the Chief Inspector and to the satisfaction of any applicable tests that he or she may direct.

On projects contracted with the Authority, this letter shall signal the start of the 12 month warranty period which is required of the contractor.

On projects for private development, this letter will allow the developer to apply for a permit for the next phase of development.

In no case will the conditional approval letter be considered as final acceptance of the project, nor will the contractor and developer be relieved of their responsibility to protect and maintain the system until final acceptance is given. A conditional approval letter may be issued for the sewer lines in a subdivision before the off-site sewers are complete, but this will be noted in the letter and no building permits will be issued before completion of the entire sewer system.

2.) Upon completion of all work items in a private development including water and sewer lines, streets, storm drains and all other utilities, the Chief Inspector or his representative will reinspect all phases of the development. During this inspection, the sewers will be checked for any cut lines, shifted manholes, excess infiltration, cleanliness of lines, adjustment of manholes, and any damage by other construction. The curbs will be checked for markings of services and off street sewers will be checked for settling and erosion and for proper landscaping.

Upon satisfactory completion of any discrepancies noted during this inspection, the developer will begin the 12 month maintenance period required for all phases of the development. (See Section 108)

3.) At the end of 12 months, the Inspector will again re-inspect the entire

development. The sewer lines shall be televised again in accordance with Section 602.7. When all discrepancies have been corrected, the Cherokee County Water and Sewerage Authority will issue an acceptance letter and will begin perpetual maintenance of the sewerage system.

4.) Easement drawings shall be prepared for work inside the development prior to approval of the final plat and/or final plans. The drawing shall show the "As-Built" sewers as constructed and mathematical relationship to property line(s). Each lot that contains a sewer line and or easement line within its boundary's shall have an easement drawing and a standard easement agreement (see S740) signed by the land owner/developer. The drawings shall be of a size suitable for legal recording and shall be prepared by a Registered Land Surveyor. The drawing must be clear and legible for printing. The drawing shall be at a reasonable scale and shall not be a copy of the plan sheet. The drawing will show property lines, the name of property owner(s), subdivision name, lot number, length of sewer line through property, size of line, line designation, manhole numbers, width of permanent easement, scale of drawing, north arrow, land lot and district numbers. Any streets or other existing easements shall also be shown. Easement agreements referencing these drawings shall be prepared and attached to the drawings, signed by the property owner(s), and recorded at the Cherokee County Clerk of Superior Court's office after review by the Authority. A copy of the recorded easement agreement shall be provided to the Authority before the final plat will be signed by the Authority.

5.) When the project is completed, the Developer shall forward one copy of the recorded final plat to the Authority's G.P.S. Department at the Rose Creek Facility. Water meter sales shall not be released to the project until the recorded final plat is delivered to the Authority.

604. "AS-BUILT" DRAWINGS

At the completion of the sanitary sewer lines and when requesting the final project inspection, the Authority's G.P.S. Coordinator shall receive from the Contractor three sets of printed "As-Built" plans and electronic data prepared in accordance with the following requirements:

1.) Attached to the As-Builts shall be a completed Project Information Form (Exhibit B), which includes the name of the project, the project location, the Developer's name and telephone number, the Contractor's name and telephone number, the street names, the sewer main size for each street or cross-country line, the length of each sewer main by street or segment, the pipe material used for each

street or segment, the cost of the sewer facilities for each street or segment, and the work start date and work completion date for each street or segment. (A copy of a blank Project Information Form is attached at the end of Section 600.)

2.) Three (3) sets of "As-Built" plans shall be submitted to the Authority's G.P.S. Coordinator. The plans shall show all sewer information "As-Built" in the field and any field changes made to the approved plans. In the event "As-Builts" cannot be made available at the completion of the line, the General Manager may authorize the continuation of the construction; however, the final inspection cannot be conducted and the conditional approval letter cannot be written until "As-Builts" are received. In the event that the designer does not perform the field staking, the contractor must furnish certification from a licensed engineer or surveyor attesting to the accuracy of all elevations, grades, manhole locations, and service locations. This certification and the certification of the engineer / land surveyor preparing the "As-Builts" must be shown on the drawings. "As-built" drawings shall include a site plan, plan and profile sheets, and any supplementary drawings and shop drawings. Stationing of the sewer gravity and force main alignments, manholes and service laterals shall be required on the "As-Builts" as well as the construction drawings along with the Point I.D. The "As-Built" drawings shall meet the same requirements as the construction plans for review.

As-built plans shall be submitted on 24 x 36 drawing sheets and shall be submitted concurrently in an "Autocad" drawing electronic format. The monumentation and the calculations used to reference and determine the coordinate system for locations shall be supplied at the same time that As-Built plans are submitted. As-built information for utility locations shall be shown on plans and submitted in ASCII text electronic format for each point.

Horizontal locations shall be referenced to Georgia State Plane Coordinates (West Zone feet). Vertical locations shall be shown referenced to Mean Sea Level. Reference all horizontal locations to the NAD83/94 (latest adjustment) datum and reference all vertical locations to the NAVD88 datum. All orthometric locations shall be referenced to Geoid 99/03. All points shall be verifiable by the Cherokee County Water & Sewerage Authority control network. All Horizontal and Vertical location shall have no translation, rotation or angle adjustment. All points are subject to verification by the Cherokee County Water & Sewerage Authority.

The information submitted electronically for as-builts of gravity sewer lines shall include:

a.) Manhole ID (CCWSA Staff will assign manhole ID numbers during plan review. The manhole ID numbers shall be shown

on the revised construction plans submitted for final review before the plans are stamped. (See Section 102.6.) The same ID numbers shall be used for as-builts. (See Section 604.)

b.) Northing
c.) Easting
d.) Center of Manhole (Lid) Elevation
e.) Invert (In and Out) Elevations
f.) Each Manhole point shall include pipe(s) entering and leaving manhole. Pipe(s) size, Pipe Invert, Material, Type (i.e. Sewer line, service line or force main).

The information submitted electronically for sewer force mains shall include:

Force Mains along County or State Roads and cross country shall be located at 50' intervals (ground and top of pipe). If Force Main is within the development and maintains a constant distance behind curb and constant depth, locate at all transitions (vertical and horizontal). All fittings, tees and bends, valves, and air release valves shall also be located. All vertical locations shall be finished ground and top of pipe. The rim elevation, top of pipe and the manhole invert elevation of all air release valve manholes shall be located. The size and material of all pipes shall be recorded.

Force Main Pipe Lines, Fittings etc…

a.) Point ID (see CCWSA staff)
b.) Northing
c.) Easting
d.) Ground Elevation
e.) Top of Pipe Elevation
f.) Point Description/Fitting Type and Pipe Size

Air Release Valves (Manholes)

a.) Manhole ID (CCWSA staff will assign manhole ID number during plan review. The manhole ID numbers shall be shown on the revised construction plans submitted for final review before the plans are stamped. (See Section 102.6.) The same ID numbers shall be used for As-Builts. (See Section 604.)
b.) Northing
c.) Easting
d.) Center of Manhole (Lid) Elevation
e.) Invert Elevation

f.) Top of Pipe Elevation

g.) Each Air Release Valve Manhole point shall include Pipe Size and Material.

The following are specific guidelines for the preparation of the printed version of the "as-built" drawings:

A.) Sewer "As-Built" shall be a separate plan.
B.) No contour lines.
C.) Approximate depth of lateral should be shown.
D.) Any lateral that does come out at a 90 degree angle shall show its distance from property pins.
E.) Road names shall be on plans.
F.) All measurements of laterals should be kept between manholes and both sides shall add up to the distance between manholes.
G.) The center of all manhole rims shall be located horizontally and vertically as described above.
H.) All lots are to be numbered.
I.) Printed "As-Builts" are to be clear and legible.
J.) Profiles are to be included in all "As-Builts".
K.) Roads shall be shown on all plans.
L.) "As-Built" is to be in large clear print on plans.
M.) Drawings sheet shall be no larger than 24" x 36".
N.) Scale no larger than 1"=20', no smaller than 1"=100' for cross-country lines and 1"=50' for congested areas.
O.) When a phase of a subdivision is completed, a location sketch of the entire subdivision with said phase outlined shall appear on plans.
P.) Line designation shall be used for correlation between profiles and plan view.
Q.) Ground water and solid rock encountered during construction will be noted on "As-Builts".
R.) Force Mains shall be located as described above.
S.) Sewer point I.D.'s (M.H. I.D., Force Main points, etc…) shall be on plans, electronic data and ASCII or EXCEL data file. All point I.D.'s shall correspond.

3.) As-Built sanitary sewer plans for commercial, multi-family, school and industrial sites shall show the following at a minimum scale of 1" = 100':

a.) Location, size and elevation of all sanitary sewer lines and of any easements required.
b.) Location, size and number of dwelling units and buildings.

4.) The As-Builts must be printed from the Autocad files supplied to the Authority concurrently with the As-Builts. These plans shall have been corrected to show all field changes made to the approved drawings. Hand marked copies prepared by the contractor will not be accepted for "As-Builts".

5.) As-Built drawings shall include the site plan, construction plan sheets, and any supplementary drawings and shop drawings. Plan of lift stations or other special features should be shown if applicable. "As-Builts" is to be stamped in large clear print on plans.

6.) The Authority shall have the right to withhold water meters until the “As-Builts” have been submitted as required.

7.) The conditional approval letter will not be issued until “As-Builts” have been completed and submitted to the Authority.

8.) Final Plat and or Final Plans will not be approved or signed by the Authority until “As-Builts”, easement drawing and easement agreements have been completed and submitted to the Authority.

EXHIBIT "B"
Cherokee County Water & Sewerage Authority
PROJECT INFORMATION FORM
SEWER SYSTEM FACILITIES

Project Name: ____

Location: ____

Developer: __________________________________ Phone No: (___)______ - _______

Contractor: __________________________________ Phone No: (___)______ - _______

Street or Segment Name: ____

Sewer Main Size: _______ Length: _______ Material: _______ No. of Manholes: ______

Start Date: ______ / _______ / _______ Completion Date: _______ / _______ / _______

Street or Segment Name: ____

Sewer Main Size: _______ Length: _______ Material: _______ No. of Manholes: ______

Start Date: ______ / _______ / _______ Completion Date: _______ / _______ / _______

Street or Segment Name: ____

Sewer Main Size: _______ Length: _______ Material: _______ No. of Manholes: ______

Start Date: ______ / _______ / _______ Completion Date: _______ / _______ / _______

Street or Segment Name: ____

Sewer Main Size: _______ Length: _______ Material: _______ No. of Manholes: ______

Start Date: ______ / _______ / _______ Completion Date: _______ / _______ / _______