



MSD Survey Standards for Capital Improvement Projects

January 2019

TABLE OF CONTENTS

	<u>Page</u>
1. INTENT AND PURPOSE	3
2. GENERAL INFORMATION	3 - 4
3. INSURANCE REQUIREMENTS	4 - 5
4. SURVEY REQUIREMENTS	5 - 8
5. SURVEY DATA	8 - 11
6. AS-BUILT SURVEYS	12
7. EASEMENT PLATS	13 - 16
8. FEE PROPOSALS	16
9. EXHIBITS	16 - 18

STANDARD SURVEY SPECIFICATIONS FOR MSD CAPITAL IMPROVEMENT PROGRAM PROJECTS

SECTION 1 - INTENT AND PURPOSE

- 1.01 It is the intent and purpose of these standard specifications to provide requirements for surveys prepared for MSD's Capital Improvement Program (CIP) projects.
- 1.02 These specifications are not intended to replace or amend MSD's "Sewer Extension Manual" or "Sewer Extension Procedures, Standards, and Specifications Manual". The "Sewer Extension Manual" is prepared by MSD Planning and Development Department and is for construction of public and private sewer lines by individuals and firms for eventual operation and maintenance by MSD. Contained within the "Sewer Extension Manual" are guidelines for easement plats and surveys. These specifications shall not alter those guidelines and requirements.

SECTION 2 - GENERAL INFORMATION

- 2.01 MSD shall issue a Purchase Order for all survey work. No work may begin on a project until the Purchase Order has been issued and the surveyor is notified by the MSD Project Engineer to proceed.
- 2.02 **All surveys and changes thereto shall be coordinated through the MSD Project Engineer in charge of the Survey/Design project and only those directives of the MSD Project Engineer shall be valid and binding on MSD.** The surveyor may receive requests for changes, modifications, or additional services directly from other MSD personnel, such as MSD ROW Manager or Agent and/or MSD's Legal Advisors preparing easement documents and title searches; however, when any such requests or changes are received which would involve additional costs to the project and MSD, the surveyor shall notify MSD's Project Engineer of such changes and shall receive approval from the Project Engineer before proceeding with such changes. Failure of the surveyor to notify MSD's Project Engineer and receive approval from the Project Engineer before proceeding may jeopardize the surveyor's right to be paid for the additional services and costs.
- 2.03 The Surveyor shall notify MSD not less than 14 calendar days prior to his beginning of field work on all surveys so that MSD can provide notice to the property owners within the Surveyor's work area. MSD's Project Engineer shall provide notice to property owners along the route, including a brief description of the project and the Engineer's contact information for any questions.
- 2.04 Should a property owner ask the Surveyor or his employees to leave the property, he shall immediately comply with that request and shall immediately notify the Project Engineer that he has been refused access to such property or that he has been asked by the property owner to leave the property.

- 2.05 The Surveyor shall research existing public records including, but not limited to, those found in the Buncombe County Tax Office and the Buncombe County Register of Deeds Office to determine the ownership of properties along the route of the survey and to establish boundaries of those properties.
- 2.06 Any and all visible or determinable encroachments and/or easements on the property being surveyed or adjacent thereto shall be accurately located and clearly indicated in the survey. The Surveyor shall be required to research existing public records of all properties through which the project limits cross or abut to verify the existence and limits of such easements or rights of way, to the extent possible.
- 2.07 MSD shall have full use of all information provided by the Surveyor. Said information may be used by MSD as needed for the completion of this project or future projects. Further, MSD shall have the right to incorporate part or all of the information provided into MSD's sewer system database and to use such information as it deems fit or necessary. However, MSD shall not amend or revise any information prepared by the Surveyor.
- 2.08 On projects that do not, in the opinion of the MSD Project Engineer, warrant the level of survey and data collection as specified above, the MSD Project Engineer may waive some of the above requirements and items to be included in the surveys, except those required by State Bidding and Procurement Statutes, the NC Board of Examiners for Engineers & Surveyors rules, regulations and/or standards, and the Buncombe County Register of Deeds, and further provided that such exceptions are noted in the Engineer's RFP, in the Surveyor's written Proposal and are made a part of the Purchase Order conditions and provisions.

SECTION 3 - INSURANCE REQUIREMENTS

- 3.01 Firms that successfully negotiate contracts with MSD **shall** have in effect during the life of the contract and shall furnish proof (when requested) of:
- (a) **Public Liability Insurance:** in the amount of not less than \$100,000 per project or per accident for small or medium size projects and \$1,000,000 for major projects and interceptor mains.
- (b) **Workman's Compensation Insurance:** (as required by State law)
- 3.02 Firms are also required to have in effect during the life of the contract and for a reasonable period of time thereafter, **Errors and Omission Insurance** of not less than \$100,000 for small or medium size projects and \$1,000,000 for major lines and interceptors. If a firm does not have Errors and Omissions Insurance, they may be required, as part of the contract negotiations and contract documents, to execute a "Hold Harmless" agreement protecting MSD, its Board of Directors and employees from any and all claims for damages by a third party for errors or omissions in the Surveyor's work or lack thereof.

- 3.03** The term “small and medium size projects” in Paragraph 3.01 and 3.02 shall be defined as projects with estimated construction costs of less than \$1,000,000. The term “major projects and interceptor mains” shall be defined as projects with estimated construction costs of \$1,000,000 or greater.

SECTION 4 - SURVEY REQUIREMENTS

- 4.01** All surveys shall meet or exceed the requirements as set forth in NCGS 47-30; NCGS 89C and 21 NCAC 56. The Surveyor shall a Class “A” vertical and horizontal control survey per Section 21-56.1600 thru 21-51.1609 of the Board Rules “Standards of Practice for Land Surveying in North Carolina”.
- 4.02** All surveys shall be performed by or under the direct supervision of a Professional Land Surveyor duly licensed by the state of North Carolina as required in NCGS 89C. Any firm performing work under this contract that is classified by the state statutes as “Surveying” shall be in compliance with the requirements of Chapter 55B of the North Carolina General Statutes (Professional Corporation Act).
- 4.03** Contact NC811 and have all utilities marked prior to the performance of field survey work and to obtain any available plans for each utility in the designated survey area.
- 4.04** Control
- (a) All horizontal traverse control points shall be clearly indicated on the survey maps and documents. All horizontal traverse control points and back sights shall have x, y, and z coordinates relative to NC Grid North NAD83(2011) and NAVD88 (geoid12B). Horizontal traverse control monuments shall be provided so that there is a “visible line of sight” between any two consecutive points but in no case, shall the distance between consecutive horizontal traverse control monuments be more than 500 feet.
 - (b) Surveys shall be tied to NGS or NCGS geodetic monuments with a bearing and distance tie shown to at least two survey control points. Note on the survey whether distances are grid or ground measurements and state the combined scale factor for conversion between the two. If ties are established by GPS methods, the surveyor shall provide method of GPS observations (i.e. static, OPUS-Static, OPUS-Rapid, RTN, etc.) and combined factor used for the project.
 - (c) The Surveyor shall install permanent markers for project traverse control points of sufficient quantity so that manhole locations and other critical project points can be re-established by MSD personnel or others.
 - (d) Vertical control monuments (benchmarks) to be used to establish grades and elevations for construction of the project shall be provided. Vertical controls shall be marked by “x” on fixed objects, such as: flange nuts on fire hydrants (not top of valve stem), nails

in pavement, bolts or nails driven into tree trunks or roots or other easily identifiable markings.

- (e) Vertical control monuments shall be located by x, y, and z coordinates provided they are tied and referenced by distances to at least two items which are located by x, y, and z coordinates. Iron pins driven into the ground are not recommended for vertical controls unless they are outside the project construction limits and are situated so as to not likely be disturbed by project activities.
- (f) Vertical control monuments shall be provided at intervals of not more than 500 feet. Where steep or severe terrain is encountered, vertical control monuments shall be spaced so that there is not more than 25 feet elevation difference between any two consecutive monuments. All vertical control monuments shall be shown on the Plans with a general description of the monument and the elevation of the monument referenced to NAVD88 (geoid12B) datum.
- (g) Vertical control monuments shall be referenced to two readily identifiable back sights by bearings and distances. Descriptions and elevations shall be provided for all vertical control monuments.
- (h) **It is imperative that the Surveyor provide durable and permanent horizontal and vertical monumentation of their survey control points and that those points be installed in locations that will remain undisturbed from the time of their installation to the time as-built surveys are completed.** Further, the Surveyor shall maintain their records and data in a form that is easily retrievable and accessible to MSD and/or other Surveyors working on MSD's projects until the project has been completed and Record Drawings have been made.

4.05 Watercourses

- (a) For all surveys, consult current USGS quadrangle maps and physically locate any blue-line streams crossing the project area.
- (b) Limits of wetlands and flood plains shall be shown to the extent they are identifiable. Where the Surveyor is not able to identify the limits of the wetlands, he shall indicate that they are present and should be determined by more detailed studies. The Surveyor shall indicate the limits of all floodways and flood plains as shown on the latest edition of the F.I.R.M. maps.

4.06 Aerial surveys may be used to prepare topographic surveys. All photography shall be of sufficient detail to identify all objects required in the location surveys or shall be supplemented by ground surveys as necessary to provide the detail required for location surveys. Aerial surveys shall show all ground control monuments as may be established and necessary for this project. Ground control shall have x, y, and z coordinates, be identifiable points set on easily recognized and fixed objects and shall be tied to NGS monumentation. Aerial photographic surveys may not be used where existing tree coverage

would limit the detail to the extent that creeks, buildings, roads, sewer manholes, and major trees cannot be distinguished. The surveyor shall specify in his proposal if he will be using aerial photography for topographic and/or location surveys. All aerial photography used to prepare topographic mapping and surveys shall be flown and completed by certified and licensed personnel in the field of photogrammetry. A digital copy of the aerial topography maps (in AutoCAD format) shall be provided to MSD as part of the project data. If topographic maps are made from aerial photography, all creek crossings must be supplemented by actual field cross-sections showing the creek bottom profile.

4.07 Contours

- (a) Contours for topographic mapping on site surveys should be generated at two (2) foot contour intervals unless otherwise specified by the engineer.
- (b) Use two layers only for contours (major and minor) V-TOPO-MAJR and V-TOPO-MINR. Assign Elevations to each contour line (polyline) with labels on Major contour.

4.08 Digital Drawings - Deliverables

- (a) Drawings shall be provided in AutoCad format (2010 version or later). The Surveyor shall show in his maps and drawings a legend of all symbols and line types used on his map and drawing. **If the Surveyor does not use AutoCAD, he shall be required to inform MSD prior to submitting a proposal.**
- (b) Along with the AutoCad DWG file, also provide an ASCII file of all control points and survey points, comma delimited, containing the Point Number, Northing, Easting, Elevation and Point Description in that order (PNEZD).
- (c) Provide a signed PDF copy of the survey.
- (d) Surveyors must also provide a LandXML file for MSD to rebuild the existing surface.
- (e) Title block, north arrow, vicinity sketch and sheet border. Digital files and coordinates shall not be rotated from the north orientation. However, you may rotate the north arrow to match the orientation of the viewport only in paperspace.
- (f) All survey points should be connected accordingly. All lines are to be drawn as polylines. Do not apply a line thickness for any linetypes; the only exception would be for storm lines showing the thickness of pipe. Leave all linetype scales at 1.
- (g) Name of individual property owners, PIN numbers, deed references, and plat book reference (if applicable).
- (h) All text shall be Multiline Text (Mtext) and should be ARIAL font with text height at .08

- (i) All symbols used must be blocks or wblocks.
- (j) All buildings and driveways should be hatched and labeled.
- (k) When labeling existing manholes with multiple inverts, label each line with (A), (B), (C), etc. Use leader or Mtext and list with EXMH #'s, Rim Elev., (A) pipe size Inv. In = xxxx.xx', (B) pipe size Inv. In = xxxx.xx', (C) pipe size Inv. Out = xxxx.xx'.
- (l) Use appropriate layers to correspond with survey points.
 *Example:
 EP should be on a layer V-ROAD-ASPH, V-ROAD-GRVL, V-ROAD-CONC;
 BLDG on layer V-BLDG-LINE, etc.
 *Use **separate layers and linetypes for property lines and right-of-way lines using the same format above.**
- (m) Additional layers such as property lines, owners, easement lines, and contours may be added as needed but additional layer names must follow the naming convention as set forth (V-0000-0000-0000). **No** layers are to be notated by numbers except layer 0.
- (n) Purge drawing file to remove unused items in your drawing file before sending.

SECTION 5 - SURVEY DATA

5.01 Route & Site Topography

- (a) MSD will provide a general location of its sewer lines and manholes and will identify the general limits of the survey.
- (b) Locate all fixed improvements and natural features within the designated design area that will impact engineering design and/or actual construction. Provide the ground elevation profile along the proposed route.

5.02 General Survey

- (a) Items to locate include but are not limited to:
 - Top of banks (rivers, ponds, wetlands and other surface water bodies)
 - Toe of slope
 - Ditch lines
 - Riprap outlets
 - Retaining walls (material, height, etc.)
 - Steps
 - Signs
 - Pull boxes
 - Traffic signal boxes

- Mailboxes
- Trees (size, type) 8 inches in diameter and larger
- Ornamental trees, shrubs and bushes
- Building corners with finished floor elevations labeled
- Gardens/Planters
- Farmed and landscaped areas
- Fences (material type)
- Headwalls and wingwalls
- Sidewalks and walkways
- Lighting
- Regular spot elevations shall be shown
- High points and low points along the survey line

(b) Roads, Driveways and Railroad Tracks

- Note type of pavement material (dirt, gravel, concrete, asphalt).
- Indicate where concrete pavement is overlaid with asphalt.
- Label SR-Numbers and local road names on drawings. Include right-of-way width, Deed Book/Page number and Plat Book/Page number (if applicable).
- If there is a paved apron and transition to gravel this needs to be located and shown on the final mapping.
- Pay special attention to the curve (radius) of driveways. Locate enough points along the curve to adequately describe its position.
- Locate driveway culverts and include pipe size, material and inverts (both sides). Provide ground shot at the edge of the driveway where culvert crosses.
- Note house number which corresponds to located driveways and roads.
- Locate all curbing.
- Railroad tracks distances to nearest mile post from pipe crossing, width of track(s), top of tracks, slope locations, number of tracks and railroad right of way widths with Deed Book/Page number and Plat Book/Page number (if applicable).
- Railroad Crossing arms and controls.

(c) Locate Electric

- Utility poles & guy wires
- Power lines and structures (note route of wire)
- Transformers
- Note if home/business has overhead or underground service.

(d) Locate Telephone

- Telephone lines and structures (note route of wire)

(e) Locate Gas

- Gas lines and structures
- Test stations

(f) Locate Cable

- Cable TV lines and structures (note route of wire)

(g) Locate Fiber Optic

- Fiber optic lines and structures
- Fiber optic signs

(h) Drainage

- Pay special attention to how the drainage in the area flows and double check to make sure all culverts are located. For culverts, label pipe size, material, and invert. If invert of culvert has sediment deposition, remove sediment to achieve accurate invert elevation.
- For culverts provide additional information upstream and/or downstream to map the creek (at least 25 feet each way).
- For culverts under roads provide a shot at point where culvert appears to go under the pavement.
- Locate all flowing water.

(i) Storm Sewer

- Locate and label invert elevation of all drop inlets, yard inlets, curb inlets, catch basins, junctions and the top of each structure.
- Locate all pipes in design area and label direction of flow. Provide pipe size and material. If culverts have headwalls and/or wing walls provide adequate shots and accurately draw structure.
- Show system connectivity.

(j) Sanitary Sewer

- Locate and label top elevation and invert elevation of all manholes and label manhole material.
- Label all MSD existing manholes with MSD manhole numbers.
- Locate all pipes inside design area and label direction of flow. Provide all inverts in and out, pipe sizes and materials for each pipe.
- For projects to provide new service, provide a ground shot with finished floor elevation at each home/business/building to be served.
- Include sewer right of way and recorded easement widths and limits.
- Locate sewer cleanouts, label sizes and invert elevation.
- Locate private residential pump stations.
- Show system connectivity.

(k) Locate Water

- Valves, hydrants, water meters, air release valves, tanks and spigots
- Wells and individual water systems

(l) Property Corners

- Locate and label all visible property corners, NCDOT right of way monuments and any NGS or NCGS geodetic monuments along route or in design area.

5.03 Treatment Plants & Pump Stations

(a) In addition to the items previously outlined, treatment plants and pump stations have specific features and structures that are needed for engineering design. Consult the engineer before performing the field survey to identify the specific items that are needed for the project. Items to locate include but are not limited to:

- Show dimensions, shape, materials and location of all tanks and other structures.
- Label top of wall elevations of all treatment structures.
- Label bottom of basin elevations for all treatment structures. Some basins may not be flat-bottomed. Check with the engineer and treatment plant personnel about this before beginning the field survey.
- Locate water levels in all treatment structures and note the time and date the measurement was made. Locate both sides of structures with differential water levels.
- Locate weirs and provide details and elevations.
- Locate all pumps.
- Locate all valves.
- Locate stop/slide gates and provide size and elevations.
- Locate and show connectivity for all above and below grade piping arrangements/alignments (to the greatest degree practical).
- Locate stockpiled or stored materials.
- Locate downspouts from structures with underground connections to storm drainage.
- Locate wet wells. Provide size (inside diameter), pipe inverts, bottom & top elevations, and vent pipe elevations.
- Locate electrical panels.
- Locate generators.

SECTION 6 - AS-BUILT SURVEYS

6.01 MSD may require as-built surveys and drawings to be prepared by the Surveyor upon the completion of construction on the project. As-built surveys shall be provided by the Surveyor upon request by the MSD Project Engineer and/or the Drafting/Design Manager.

The following data shall be secured by the surveyor from physical surveys of the completed construction:

(a) Establish geodetic survey control in the project area tied to NAD83(2011) and NAVD88 (geoid12B) for field surveying and mapping efforts to include:

- Provide Material, Length, and Diameter of Pipe.
- Provide Percent of Grade (Pipe Slope).
- Provide Northing, Easting, Top and Invert elevations for all manholes and all interior pipes.
- Provide Northing, Easting and Top elevations for all cleanouts (Service lines from sewer main to first cleanout).
- Any new changes to existing utilities, roadway pavements, ditches, etc. that varied from project plans.

6.02 Digital Drawings - Deliverables

(a) Drawing file shall be provided in AutoCad format (2010 version or later).

(b) Provide an ASCII point file (.txt), (PNEZD) comma delimited, to include:

- Point Number
- Northing to four decimal places
- Easting to four decimal places
- Top Elevation to two decimal places (Manholes Only)
- Invert Out Elevation to two decimal places (Manholes Only)
- Description shall be: CO for cleanouts, MH for new manholes, EMH for existing manholes

6.03 MSD's Construction Management Division and/or the Drafting/Design Manager shall provide the Surveyor construction mark-up drawings to use in performing the as-built survey.

For clarification or additional information concerning these requirements (sections 4, 5 and 6), contact MSD's Drafting/Design Manager at telephone number 828-254-9646.

SECTION 7 - EASEMENT PLATS

- 7.01** All plats shall meet North Carolina General Statutes, the North Carolina Administrative Code and Buncombe County Register of Deeds' requirements. Plats shall be signed and sealed by a Professional Land Surveyor duly licensed by the State of North Carolina. The size and scale for all easement plats shall be as follows, unless otherwise directed by the MSD ROW Manager:
- (a) 8.5" X 14" at a scale no less than 1" = 50',
 - (b) If parcels are large and data is too dense on an 8.5" X 14" size, they may be prepared on a 24" X 18", or 24" X 36 size at a scale no less than 1" = 50'.
 - (c) If the Permanent Easement and/or the Temporary Construction Easement is very small, contact the MSD Project Engineer to determine if the sewer centerline can be shifted to avoid the parcel and plat entirely.
- 7.02** Plats shall include the items below. Separate plats shall be prepared for each parcel unless otherwise directed by the MSD ROW Manager.
- (a) Record owner(s) of subject parcel, including PIN number and Deed reference.
 - (b) Record owner(s) of any adjoining parcels, including PIN numbers and Deed references.
 - (c) Limits of the property from which the easement is to be acquired along with bearings and distances sufficient to describe the parcel boundary. Where the property is large and some property lines are not involved in the determination of the easement limits, the Surveyor shall show a reasonable portion of the entire parcel such that the location and limits of the easement are clear. Questions regarding how much of the property boundary to show should be directed to the MSD ROW Manager.
 - (d) Limits of the easement to be acquired along with bearings and distances sufficient to describe the limits and areas of the easement. The surveyor may use line tables for all bearings and distances **or** show bearings and distances around each line segment if scale and room on the drawing allow for clear reading of information. However, do not mix the two methodologies; use one or the other. If the use of a line table is employed, number the corresponding line segments, or "L" numbers (or "C" numbers) in ascending order from the beginning point of the permanent easement and continue in a clockwise direction around the permanent easement(s), then the temporary construction easement(s). Do not switch direction.
 - (e) Where easements fall within areas of deed gaps, the area shall be labeled as "Apparent Deed Gap". Bearings and distances or tie lines necessary to describe the limits of the permanent and temporary construction easements within the gap area shall be provided. Follow the same line table or line segment methodology described in 7.02 (d) above.

- (f) All existing, known and/or recorded easements and rights of way crossing the proposed MSD easement.
- (g) A Title Block entitled “Easement across the Property of (owner’s name)” showing MSD’s project name/number and all other data as required in NCGS 47-30.
- (h) A revision block to include a format for plat revisions including a short description of the revision and the date of such revision.
- (i) All public and private street rights of way shall be shown and properly labeled. The name of streets and state road numbers (where applicable) shall be shown. The recorded street right of way width shall be shown, citing the record instrument. If no recorded information can be found, the Surveyor shall include a note indicating the right of way is unknown.
- (j) The following notes shall be included on the plat:
- All distances are NC Grid distances unless otherwise noted.
 - No corners set unless otherwise noted.
- (k) Label the width of the permanent easement and the width of the temporary construction easement separately. Do not combine the widths.
- (l) Distinguish between the proposed sewer line and any existing sewer line(s) shown on the drawing either by distinguishing line styles or symbology.
- (m) A legend shall be provided on the plat for all line types and symbols.
- (n) A vicinity sketch containing a north arrow and showing sufficient detail to determine the general site location and area.
- (o) An area table showing square footage/acreage of the permanent easement and temporary construction easement depicted. Specific language for said table is shown below:
- Permanent Easement = (insert square footage) OR (insert acreage)
 - Temporary Construction Easement = (insert square footage) OR (insert acreage)
- (p) If the MSD Project Engineer directs that existing easement areas are to be netted out of any new permanent easement areas, the “Net New Easement Areas” form, attached to these standards is to be used in calculation of said areas. The MSD Project Engineer will determine, based on MSD’s locations of the existing lines, which parcels, if any, are to be netted. Any questions regarding the calculation and use of this form are to be directed to MSD’s ROW Manager.

- (q) At least one corner of the subject property **or** permanent easement shall be tied to the NC State Plane Coordinate system. If tying to a property corner, the bearings and distances from that property corner to the beginning point of the permanent easement shall be provided.
- (r) All houses and structures within 50 feet of the proposed sewer center line shall be shown. Where houses or structures would fall within the limits of the proposed permanent or temporary construction easements, the Surveyor shall notify the MSD Project Engineer and shall adjust the limits of the easement so that the structure is not within the limits of the easement unless directed otherwise. In such cases, the limits of the easement shall be **no closer than 3 feet** from the building's visible foundation. The plat shall show the width of the easement (from centerline easement to outside boundary) for both temporary construction and permanent easements. Unless directed otherwise by the MSD Project Engineer, no easement line shall be shown bisecting or going through a residential dwelling.
- (s) Trees, visible improvements, waterways and utilities shall be shown within the survey limits as defined by MSD.
- (t) Be clear and consistent using the same line styles, colors, symbology, etc. for all plats.
- (u) **Review all plats for errors before submittal to MSD.**

- 7.03 Three (3) original, signed and sealed plats for each parcel, along with one net new sheet, if applicable, shall be forwarded to the MSD Project Engineer as deliverables.
- 7.04 Staking of easement limits may be requested across certain properties to identify the location of the proposed sewer line and associated easement. When so requested, the Surveyor shall stake the pipe centerline and permanent and temporary construction easements at intervals sufficient to clearly delineate same. All stakes shall be flagged with colored tape and shall contain sufficient markings to clearly identify the station number and the type and width of the easement. **The pipe centerline shall be marked with pink flagging; the permanent easement with green flagging and the temporary construction easement with yellow flagging.** Payment for staking services under this item shall be negotiated and approved prior to beginning the staking.
- 7.05 Sometimes plat revisions are necessary. Where such revisions are due to errors or omissions of required elements by the Surveyor, such revisions shall be considered as incidental to the contract with no additional compensation required. Where such revisions are the result of changes made by MSD the Surveyor may request additional compensation. Such compensation shall be negotiated and approved prior to beginning the additional work.

SECTION 8 - FEE PROPOSALS

- 8.01** The Surveyor shall submit a fee proposal setting forth the scope of survey services and deliverables. For projects where easement plats are necessary, a separate fee proposal shall be provided. Where additional work is necessary on any aspect of a project, appropriate change orders and purchase orders must be issued prior to beginning the additional work.
- 8.02** The Surveyor shall specify the start date and completion date for services provided in the proposal.
- 8.03** The Surveyor shall designate a representative from his firm to act as contact person for all meetings and inquiries and to coordinate the work and other aspects of the contract with MSD's Project Engineer. Decisions of the representative shall be binding on the Surveyor.
- 8.04** The Surveyor shall provide in the proposal his Professional Land Surveying registration number and the firm's corporate registration number, if incorporated.
- 8.05** The Surveyor shall provide in the proposal the firm's name, location, mailing address, and phone number along with any cell numbers and email addresses as appropriate for staff representatives.

SECTION 9 - EXHIBITS

- 9.01** The following items are being attached to these specifications for the Surveyor's use and reference:
- (a)** Exhibit A: MSD Easement Width Chart showing easement width requirements for sewer line diameter vs. trench depth (see page 17 of 18).
 - (b)** Exhibit B: Net New Easement Form (see page 18 of 18).

Exhibit A

Easement Width Chart

Metropolitan Sewerage District Required Permanent Easement Widths

Where the depth of sanitary sewers exceeds twenty feet (20') or where slopes exceed 30%, easement widths will be determined by the District on a case by case basis.

Trench Depth	8"- 12" Sewer Right of Way	15"- 18" Sewer Right of Way	21"- 27" Sewer Right of Way	30"- 36" Sewer Right of Way	42"- 54" Sewer Right of Way
0-6	20'	20'	25'	25'	30'
6-8	20'	20'	25'	25'	30'
8-10	20'	25'	25'	25'	30'
10-12	20'	25'	25'	30'	30'
12-14	25'	30'	30'	35'	35'
14-16	30'	35'	35'	40'	40'
16-18	30'	35'	40'	40'	40'
18-20	30'	40'	45'	45'	45'

Exhibit B

**Metropolitan Sewerage District of Buncombe
County Net New Permanent Easement Area**

MSD Project Name: _____

MSD Project Number: _____

The net new permanent easement area equals the total area of proposed permanent easement less the total area of existing permanent easement, as claimed by MSD, which crosses (overlays) the proposed alignment. Note that temporary construction easement areas are not netted.

I, _____, a Professional Land Surveyor, hereby certify that the Net New Permanent Easement Area for PIN# _____ is:

_____ SF (_____ AC)

_____, 20 _____

Professional Land Surveyor

(Seal)