DESIGN AND CONSTRUCTION STANDARDS

SECTION 7 - DATA ACQUISITION AND COMPOSITION

7.1 Subsurface Utility Engineering (SUE)

SUE work shall be performed in accordance with the American Society of Civil Engineers (ASCE), CI/ASCE 38-02, *Standard Guideline for the Collection and Depiction of Existing Subsurface Utility Data*. The following definitions shall apply.

Utility Quality Level B (QL-B) – "Information obtained through the application of appropriate surface geophysical methods to determine the existence and approximate horizontal position of subsurface utilities." This information shall be surveyed with a tolerance of not greater than one foot horizontal.

Utility Quality Level A (QL-A) – "Precise horizontal and vertical location of utilities obtained by the actual exposure…and subsequent measurement of subsurface utilities…" The accuracy shall be one inch vertical, one foot horizontal for all features except pipes greater than or equal to 24 inches in diameter and two feet horizontal for pipes greater than 24 inches in diameter.

Survey of SUE data shall be performed by the SUE firm and provided to the land surveyor, design engineer and City. SUE data shall not be surveyed by the land surveyor.

7.2 Geotechnical Engineering (Reserved)

7.3 Boundary, Topographic, and Utility Surveys

A. General Requirements

All survey work shall be performed under the direction and supervision of a land surveyor licensed by the Virginia Department of Professional and Occupational Regulation. All survey documents shall be stamped and sealed by the land surveyor who directed and supervised the associated work.

B. Horizontal and Vertical Datum

1. Horizontal control shall be based on the North American Datum of 1983 (NAD83), Virginia Coordinate System, South Zone which defines the geodetic coordinate system.

2. Vertical control shall be based on the North American Vertical Datum of 1988 (NAVD88), 92 Adjusted, Virginia State Plane Coordinate System and GEOID12B.

C. Units of Measure

Utility Mapping Standard Linear units shall be consistent with the latest State Plane Coordinate System for Virginia. United States Survey Feet (USFt) is defined to be 3937 USFt equals 1200 meters exactly. Unit conversions between USFt and meters must use this conversion exactly.

D. Global Positioning System (GPS) Requirements

1. GPS coordinates shall be populated into an ESRI file geodatabase template provided by the City.

2. The City of Norfolk Department of Utilities shall be consulted prior to design to determine if any changes in software are required.

3. All data collected using GPS methods require submittal of Global Navigation Satellite System (GNSS) receiver fields as outlined in Appendix C – Data Record Package Requirements.

7.4 Geographic Information Systems (GIS) Requirements

A. Applicability

The City of Norfolk owns, operates, and maintains the following water and wastewater utility systems located inside and outside the City's corporate boundaries:

- Raw Water Resources including groundwater wells, surface water reservoirs, and dams
- Raw Water Transmission Systems including pump stations and pipelines
- Water Treatment Plants and Storage Facilities including booster pump stations
- Drinking Water Transmission and Distribution Systems of pipelines
- Wastewater Collection Systems including gravity sewers, pump stations, and force mains

Additions, amendments, changes, improvements, and modifications of any of these systems by anyone shall be documented by the individual responsible for as-built data for integration into the Department of Utilities' Geographic Information System.

B. As-Built Data Acquisition

The data shall be:

1. Obtained and certified by a licensed surveyor and furnished to the contractor,
2. Reviewed by the contractor for quality assurance and submitted to the Department of Utilities' inspector, and
3. Reviewed by the inspector and forwarded to the GIS Team Supervisor.

C. Submission Standards

1. For contractors engaged by the City of Norfolk Department of Utilities, the as-built data record package shall include (refer to Appendix C – Data Record Package Requirements for additional detail):

- Fully populated Esri file geodatabase template provided by City (fgdb format, Appendix F-6)
- Red line markup of as-built location of existing and new assets on original construction drawing (pdf format) or GIS exhibit for annual construction contract work orders only (pdf format),
- Red line markup (pdf format) of:
    - All previously existing assets that were taken out of service and abandoned in place, and
    - All previously existing assets that were physically removed, demolished, and disposed of.
- GIS Update Submission Form provided by City, including licensed land surveyor's seal, signature and date (pdf format, Appendix F-6).

2. For projects developed by the Virginia Department of Transportation (VDOT), the Hampton Roads Sanitation District (HRSD), other City departments, and private sector developers and franchise utilities:
    - Red line markup of as-built location of existing and new assets on original construction drawing (pdf format),
    - Red line markup (pdf format) of:
        - All previously existing assets that were taken out of service and abandoned in place, and
        - All previously existing assets that were physically removed, demolished, and disposed of.
    - GIS Update Submission Form provided by City (pdf format, Appendix F-6).

D. Data Quality Verification

The contractor shall perform the following quality assurance measures before submission of the data to a Department of Utilities' inspector. Verify that:

- The data record package complies with the requirements of these *Design and Construction Standards*,
- All file geodatabase required attribute fields are populated accurately and are consistent with as-built documents.
- Coordinate values are in the right projection, are valid, accurate to the project area, contain six decimal places, and can be mapped.
- The formatting of the template and checklist has not been changed or altered (i.e. hiding, adding, or removing fields)

Incomplete data record packages will be returned to the contractor for correction.

E. Change and Question Procedures

1. Interpretation and Variance
   Refer to the Introduction to these *Design and Construction Standards*, Section III, Interpretation and Variance.

2. Changes and Updates
   Changes and updates to these geographic information system requirements will be documented by amendment and a new post to the City's website.

3. Questions or Comments
   Questions or comments about these geographic information system requirements may be addressed to the GIS Team Supervisor at the City of Norfolk Department of Utilities, 500 E. Main St., 7th Floor, Norfolk, VA 23510

F. Data Usage Disclaimer

The data developed from the Department of Utilities' existing geodatabase and these geographic information system requirements are for informational purposes only and have not been prepared for legal, engineering, or surveying activities. No expressed or implied warranty is made regarding specific accuracy or completeness.

7.5 Bid Document Organization and Format

A. Bid Drawing

Bid Drawing Sets shall consist of applicable sheets from the following list:

1. Cover Sheet
2. Notes, Legend, Abbreviations, and Water Meter Data Sheet
3. Sheet Layout Plan
4. Demolition/Abandonment Plan
5. Pavement Phasing Plan
6. Plan and Profile Sheet(s)
7. Standard Department of Utilities Detail Sheet
8. Water Connection Detail Sheet
9. Supplemental Project Detail Sheet
10. Other City Department Detail Sheets
11. Erosion and Sediment Control Detail Sheet
12. Tree Protection Notes and Detail Sheet
13. Traffic Control Sheet

B. Front End Documents and Technical Specifications

Bid Specifications shall consist of the following:

1. HRPDC Front-End Documents with Norfolk Modifications
2. Section 110 – Special Provisions
3. Construction Drawings
4. HRPDC Regional Construction Standards with Norfolk Modifications
5. Insurance Coverage
6. Measurement and Payment Items
7. Geotechnical Report
8. Soil Borings
9. SUE Reports
10. Virginian Clean Water Revolving Loan Fund (VCWRLF) Contract
11. SWWPPP
12. Project Specific Technical Specifications

C. Bid Drawing - General Requirements

1. Drawing hardcopies shall be 24 by 36 inches.
2. All sewer mains, force mains, and water mains shall be clearly shown in plan and profile view with stationing along centerline of pipe shown every 100 feet.
3. All known existing structures and utilities (above and below ground) shall be shown in plan and profile views with vertical clearances indicated if less than 24 inches from the proposed main.
4. Sewer or water lines that are not owned by the City shall be identified as "Private" with size and material shown.
5. Existing facilities and topographical survey information shall be half tone of proposed work.

6. All easements shall be clearly shown in the Plan Views, as required in Standard Design Criteria, Section 8 (Legal Relations).

7. The location of test pits shall be shown in the plan views, and labeled with GPS coordinates.

8. Benchmarks shall be labeled with GPS coordinates and spaced no more than 500 feet apart along the construction alignment (outside the limits of construction).

9. Adjacent properties shall have street addresses and GPIN numbers shown, and the building front outlined on the plan views.

10. Tree caliper and canopy size labeled.

11. All drawing sheets must be clear and legible. Text shall be sized to produce readable half-size drawings.

12. Do not show paved areas by shading in the plan view, as it may hide other information when photocopied or scanned. Stippling or cross-hatching may be used instead, provided no other information is hidden. Separate Pavement Plan sheet can also be used.

13. Drawings solely outside City Limits shall be consistence with host City's required coordinate systems.

14. For all PDF submissions, the proposed water features shall be a blue color and proposed wastewater features shall be a green color. For hard copies, final bid submissions, proposed water and sewer features shall all be black.

D. Specific Requirements for Bid Drawing Sets

1. *Cover Sheet*

    a. See Drawing Template available on City Website
    b. *Note Sheet* drawing Template available on City Website
    c. Other required notes
    d. Add legend, abbreviations, surveyor notes, sequence of construction, and water meter data if applicable

2. *Sheet Layout Plan*
   Limited Survey/Map background

    a. Limited Survey/Map background
    b. North Arrow
    c. No scale requirements
    d. Sheet frames with sheet references

e. Proposed pipe with stationing show
f. Notes for Sheet Layout Plan

3. *Demolition/Abandonment Plan*

    a. Survey/Map background
    b. North Arrow
    c. Graphic Scale
    d. Hatched pattern over pipes to be demoed/abandoned
    e. Notes for Demo/Abandonment work

4. *Pavement Phasing Plan Sheet*
   Limited Survey/Map background

    a. North Arrow
    b. Scale
    c. Hatched or gray filled areas
    d. Notes and legend
    e. Pavement Section detail

5. *Plan and Profile Sheet(s)*

    a. Plan View:

        i. Survey/Map background
        ii. North Arrow
        iii. Graphic Scale
        iv. Sheet specific notes
        v. Easements with dimensions and callouts
        vi. Tree protection and sediment & erosion measurements
        vii. Match lines with stationing and sheet references
        viii. References to detail arrangements
        ix. Adjacent property information and front of building outline
        x. Applicable proposed & existing feature callouts

    b. Profile View:

        i. Applicable boring logs
        ii. Stationing for every 100 feet
        iii. All crossing utilities showing and called out
        iv. Grade line with surface type indicated
        v. Show all valves, fittings and appurtenances with size, material coating, invert elevation, slope, call out for existing or proposed, stationing, and pipe lengths
        vi. Restraint lengths (from station to station)
        vii. Clearances to other utilities
        viii. Graphic Scale

6. *Detail Sheets*

    a. Standard Department of Utilities Details (posted on City website)
    b. Water Connection Detail (posted on City website)
    c. Supplemental Project Details
    d. Other City Department Details
    e. Erosion and Sediment Control Details
    f. Tree Protection Notes and Details

g. Traffic control notes
h. Applicable traffic control details with text

E. Additional Drawing Requirements

1. *Force Main Sheets*

   a. Plan and Profile sheets
   b. Valves, air release valves, fittings shown and called out with stationing, invert elevation, size, material, joint type, and coating
   c. Restraint lengths with stationing on profile views
   d. Pipe must slope upward at 0.2% to a highpoint with an ARV.
   e. Minimum 36 inches of pipe cover.
   f. Offsets to be made by 22.5-degree bends if possible.

2. *Gravity Sewer Collection Sheets*

   a. Plan and Profile sheets
   b. Manholes shown on profile view with stationing, invert elevation, rim elevation, and diameter in feet. All specialty options shall be called out with associated detail on detail sheet.
   c. Pipes with manhole connection invert elevations, material, pipe lengths, slope, coating systems.
   d. Arrows indicating the direction of sewer flow.

3. *Record Drawings Sheets*

   a. Built on the latest construction drawings, but with the appropriate adjustments to the layout and notes per the construction events.

4. *Wastewater Pump Stations*

   a. Complete site plan with adjacent property information, setback lines, notes, incoming gravity main with upstream manhole of station shown with all pertinent information (must be the lowest rim elevation of upstream manholes), fencing and gates, silt fencing, driveway, outgoing force main with valves and connections, odor control system, hatches, vents, handrails, and bypass pump if required.
   b. Plan view showing generator room, control room, and top of wet well with all equipment.
   c. Plan showing wet well and dry well with all equipment.
   d. Elevation of wet well, dry well, control room, and generator room with all equipment.
   e. Elevation of wet well with top of slab with all equipment.
   f. Elevation of dry well and control room with all equipment.

g. Other elevations if required.
h. Structural plans
i. Electrical plans
j. Mechanical plans
k. Architectural plans