

**Clean Water Nashville Overflow Abatement Program**

**GUIDANCE FOR DESIGN**

**SURVEY GUIDANCE AND FORMS**

Version 2.0

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# Section 1

## Survey and Mapping

### 1.1 Introduction

The following section provides specific guidance for survey and mapping for the Clean Water Nashville Overflow Abatement Program (Program). This guidance establishes standard Program methodologies and protocols in the pursuit of standard final survey products. The Designer and its sub-consultants shall adhere to this guidance unless a deviation is specifically requested in writing and approved by the Project Manager.

### 1.2 Property Owner Contact

Unless otherwise instructed by the Project Manager, the initial survey step is to contact property owners and obvious tenants within the survey project limits to inform about the surveyor's presence and obtain information such as private underground improvements, underground tanks, etc. For each owner and tenant within the survey limits, the surveyor shall prepare individual Property Owner Contact letters (see attached sample in Section 5). Each letter must be submitted through the Designer to the Project Manager for approval prior to mailing or delivering it to property owners. After the Project Manager approves the letter, it shall be mailed or hand delivered to the property owner(s) before commencing the survey. If the letter is mailed, it shall be sent at least five business days but not more than 20 business days prior to commencing the survey.

### 1.3 Property Owner Interaction

Promoting good relations with property owners is vital to MWS public relations. Because the surveyor is often the initial contact person with the property owner and tenant, establishing good relations through courteous discussions is essential when describing survey work in the name of MWS.

### 1.4 Objections to Entry

No entry shall be made on improved property unless direct contact is made with the owner or tenant and the response is positive. If a property owner or tenant objects to entry onto his/her property, the surveyor should not enter. If the survey is already in progress when the owner objects, the surveyor should leave immediately. When an objection to entry occurs, the surveyor will contact the Project Manager for guidance.

### 1.5 Safety

The Designer and its survey sub-contractors shall perform all field activities in a safe manner. The Designer and/or its survey sub-consultant shall prepare a site-specific Health and Safety Plan prior to commencing field services and shall perform and document safety inspections and briefings for the duration of the design field services. These documents should be maintained in the Surveyor's files and provided to the Designer or the Program upon request.

## Section 2

# Topographic Surveys

## 2.1 General Scope/Limits of Survey

The topographic survey shall be conducted via the following parameters:

- Extend an appropriate distance on each side of the preliminary horizontal alignment.
- Include all adjacent roadways and railroads including utilities and drainage features.
- For gravity drained utility lines, include location and invert data for the first manhole extending beyond the project/survey limits (upstream and downstream) even when they extend beyond such project/survey limits.
- All survey data shall be scaled to ground coordinates using a common data adjustment factor for the project.
- Include the preparation of property exhibits for parcels requiring easements or fee simple acquisitions.

## 2.2 Existing Property Boundaries Representation

The existing property boundaries shall be established via the following parameters:

- The existing right-of-way and property boundary shall be based on prior survey, plat, or deed.
- Delineation of mathematical dimensions and directions including curve data (arc length, delta, radius, chord length and chord bearing)
- The survey shall include record information for each parcel.
  - Current owner and mailing address
  - Recorded information - book, page or instrument number, and date
- When a minimum of two controlling monuments are not found along the property boundary, topographic data will be correlated/tied to controlling physical monuments along the boundary or to monuments on or beyond the surveyed premises that establish the surveyed premises boundary.
- Specific boundaries shall be determined for right-of-way or easement exhibits.

## 2.3 Detailed Topographic Elements

Unless otherwise specified in the specific project Scope of Work, the topographic survey shall provide the following.

- Contours at 1-foot intervals with the following exceptions:
  - Areas where the slope is greater than 2:1
  - Areas where contours can be shown at 2-foot intervals with contour errors not exceeding one-half the contour intervals
- Spot elevations on paving, structures, and other hard surfaces to the nearest 0.05 foot
- Spot elevations on other surfaces to the nearest 0.15 foot
- Spot elevations covering the entire survey limits incorporating:
  - High points
  - Low points
  - Grade changes
  - Sufficient intervals to represent the terrain's general character including, but not limited to, the following locations:
    - Along all grade break points and lines
    - In areas where the slope is less than 5:1 on a 50-foot square grid
    - On the top (at back) and bottom (at face/gutter) of curbs
    - On both sides of sidewalks at 50-foot intervals
    - Appropriately at breaks in grade
    - On roadways and driveways at the crown
    - At other cross-slope grade breaks at 50-foot intervals
    - On railroads at 100-foot intervals at the track's centerline, at top of rail, and at appropriate grade breaks
- Actual elevations of contours and spot elevations.
- Appropriately sized and oriented spot elevations and points for legibility on a printed survey
- Structures and slab locations and all corners including:
  - Retaining walls
  - Culverts
  - Street or road paving
  - Entrance drive openings
  - Tanks
  - Septic tank drain fields
  - Fences
  - Bridges
  - Ramps
  - Guardrails
  - Miscellaneous structures
  - Driveways
  - Sidewalks
  - Other obstructions
- Elevations for each floor and at each structure's entrance and at slab corners
- Mean elevation and extent of water in excavations, wells, and water bodies

- Lakes, rivers, streams, drainage courses, and legal or regulated drains on or near the surveyed alignment
- Actual water levels surveyed indicating the survey shot date
- Waterway and environmental buffer zones of record and per zoning ordinances
- For the surveyed corridor if applicable, the location and elevation for the 100-year floodplain and floodway based on the most recent available mapping from the Federal Emergency Management Agency (FEMA) or modeling from Metro or an appropriate agency.
  - Digital FEMA Flood Insurance Rate Maps can be found at <https://msc.fema.gov/>.
  - The elevation component for this item is not applicable for areas without a mapped flood elevation.
  - The floodplain source and floodway boundaries will be clearly indicated on the survey.
- Locations, elevations, and area limits of swamps and wetlands based on available mapping or if determined by others.
  - The U.S. Fish and Wildlife National Wetland Inventory maps are located at <http://www.fws.gov/wetlands/>.
  - The surveyor/Designer must also coordinate with the local Tennessee Department of Environment and Conservation field office and U.S. Army Corps of Engineers District office to identify other potential known wetland areas.
- Test boring locations, horizontal direct drilling, and/or monitoring wells, and the elevation at the top of the holes/wells shall be shown.
- All miscellaneous features including signs, lights, parking lot striping, benches, waste receptacles, bicycle racks, etc.
- Visible rock formations locations.
- Perimeter outlines for woods and thickly vegetated areas
- For trees greater than 4-inch caliper or over 10 feet tall, tree caliper in inches and common tree species name.
- Descriptions of any natural features and the ground cover/vegetation type within the survey's extent.
- Depictions of railroads including:
  - Rail data (raised lettering on the side of the rail) for the entire topographic survey limits
  - Distance to the nearest milepost and distance to any switches and “frogs” for permit references

- Street names and highway crossings or adjoining project corridor including jurisdiction, width, pavement type, and address numbers assigned to the parcel, as applicable.
- Widths for known or recorded rights-of-way (if variable, indicate as “variable” and provide appropriate dimensions to define it) along with source of information
- Utility information including locations and elevations for overhead and underground utilities based on record utility information and survey measurements for accessible utility appurtenances.
  - The surveyor shall contact Tennessee One-Call for pre-design locations and include the dig ticket number and date on the survey.
  - If the utility company is not part of the state underground utility locating service, the surveyor will contact the utility company directly and obtain all relevant mapping and markings including those which may be within adjoining public rights-of-way.
  - Available utility maps and utilities shown on a local geographic information system (GIS) shall also be included with appropriate notes or indications as to the information’s source.
  - The extent of the Sub-surface Utility Engineering, if any, will be clearly identified in the Designer survey scope of services.
  - Locations, descriptions, elevations, sizes, materials, and flow directions for sanitary sewers, storm sewers, combined sewers, storm drains, culverts, and their appurtenances such as sanitary cleanouts including:
    - Manholes and other structures such as culverts, headwalls, catch basins, and clean-outs.
    - Rim and bottom/invert elevations for each catch basin and manhole including the bottom of sumped structures and the invert elevation for each pipe.
    - Notations regarding inaccessible inverts, i.e., hooded, and water level in the structure.
    - Precise locations of all underground structure measurements utilizing aids such as Pipe Mic and/or rod-mounted clinometers to ensure all vertical measurements are orthometric to the elevation basis.
  - Locations, descriptions, elevations, and characteristics for power, communication, cable television, lighting, petroleum, and traffic control, and their appurtenances including:
 

○ Power poles	○ Telephone poles
○ Guy wires	○ Manholes
○ Anchors	○ Boxes
○ Vaults	○ Transformers
○ Lamp poles	○ Light boxes
○ Etc.	
  - Operating authority name, contact person, and phone number.
  - Lines connecting all structures and markers for each utility indicated above.

## 2.4 Field Codes

Field codes/descriptors for survey point data and line coding operators shall conform to the field code/operator library. The most current version of this information can be accessed at <http://cleanwaternashville.com/survey/> or provided electronically at the design kick-off meeting. While the coding operators (begin line, end line, PC, POC, PT, etc.) presented are preferred and encouraged, limitations in certain software may make the specified use impossible. Regardless, field codes provided in the *Design Management Manual* shall be used unless otherwise approved by the Project Manager.



## Section 3

# Survey Control

All survey projects produced under the Program will be tied to specific horizontal and vertical datum planes. Over the Program's life, these datum planes may be amended to reflect later geodetic adjustments. However, the datum established for use by the *Design Management Manual* shall be used regardless of whether or not the datum has been superseded by adjustments (from the National Geodetic Survey, etc.). For this reason, it is important to use the latest *Design Management Manual* in effect on the date the project commences. No survey is to be based on assumed datum. All vertical and horizontal survey control monuments shall be set by methods for which a relative precision can be computed and certified compared to the reference datum (i.e., closed traverse or multiple independent GPS-derived vectors).

### 3.1 Horizontal Control

Horizontal data shall be referenced to the North American Datum of 1983, Adjustment of 1995, Tennessee Zone (4100) State Plane (grid) Coordinates, abbreviated as SPCS 83 (1995). The measurement unit shall be U.S. Survey Feet. Horizontal control may be established by direct traverse or static, RTK GPS observations, or other methods as deemed appropriate by the responsible surveyor or engineer but must meet Second Order Class II (1:20,000) referenced to the Tennessee Geodetic Reference Network (TGRN).

Horizontal control point monuments shall be a semi-permanent nature. The use of #5 (5/8-inch diameter) capped deformed rebar 18 inches in length is acceptable; however, concrete monuments/disks and other generally used monumentation techniques may also be employed at the surveyor's discretion. Control monumentation should be installed outside the anticipated construction envelope to maximize the likelihood of its availability for future use after construction. Horizontal control shall be placed no greater than every 800 feet. Monumentation type and offset distances to two adjacent landmarks shall be included within the survey drawing.

Project control for route or site surveys where the longest side of the survey area exceeds 1/4 mile (0.25 mile) shall be scaled to ground/project coordinates using a datum adjustment factor (DAF). For the Program, unless otherwise directed, a common DAF of 1.00006 shall be used as follows:

$$\text{DAF} \times \text{SPC Northing} = \text{Project Ground Northing}$$

$$\text{DAF} \times \text{SPC Easting} = \text{Project Ground Easting}$$

All coordinate and drawing files shall be delivered in project ground coordinates. Orthometric elevations shall not be scaled. The survey drawings and file deliverables must designate, "*The ground coordinates for this project have been tied to the TGRN SPCS 83 (1995) and datum adjusted using a datum adjustment factor of 1.00006.*"

## 3.2 Vertical Control

Vertical data (orthometric elevations) shall be referenced to the North American Vertical Datum of 1988 (NAVD88). Measurement unit shall be U.S. Survey Feet. Vertical control may be established by differential or trigonometric leveling or GPS methods and shall meet Second Order, Class II, as defined by NGS and referenced to the Tennessee Geodetic Reference Network (TGRN).

Vertical benchmark monumentation shall be of a semi-permanent nature. The use of #5 (5/8-inch diameter) capped deformed rebar 18 inches in length is preferable; however, fire hydrant tag bolts, or railroad spikes may also be employed at the surveyor's discretion. All horizontal control points shall also be made vertical benchmarks. Vertical Control monumentation should be installed outside the anticipated construction envelope to maximize the likelihood it is available for future use after construction. Vertical control shall be placed no greater than every 500 feet. Monumentation type and offset distances to two adjacent landmarks shall be included within the survey drawing.

# Section 4

## Data Management

In addition to CADD drawing files, the following data records shall be delivered to Metro:

**Table 4-1 CADD Deliverables**

Deliverable Description	File Format	Naming Convention
Survey Drawing	AutoCAD .DWG 2007 or greater and .PDF	See CADD Standards of this Document
Raw Data for Total Station and GPS observations (multiple files okay)	ASCII/.TXT	[PROJECT_NUMBER]_X_RD.TXT Example: 12-SC-123_X_RD.TXT
Coordinate file for all ground coordinates in P, N, E, Z, format (one file)	ASCII/.TXT	[PROJECT_NUMBER]_X_GC.TXT Example: 12-SC-123_X_GC.TXT
All field notes (one file)	.DESIGNERF	[PROJECT_NUMBER]_X_FN.DESIGNERF Example: 12-SC-123_X_FN.DESIGNERF
Copies of all reference deeds and/or plats (one file per deed/plat) labeled by Tract number	.DESIGNERF	[PROJECT_NUMBER]_INSTRUMENTNO]_X_DP.DESIGNERF Example: 12-SC-123_20120101160254_X_DP.DESIGNERF

## Section 5

# Sample Property Owner Notification Letter

The Word template for this document will be provided electronically at the design kick-off meeting.

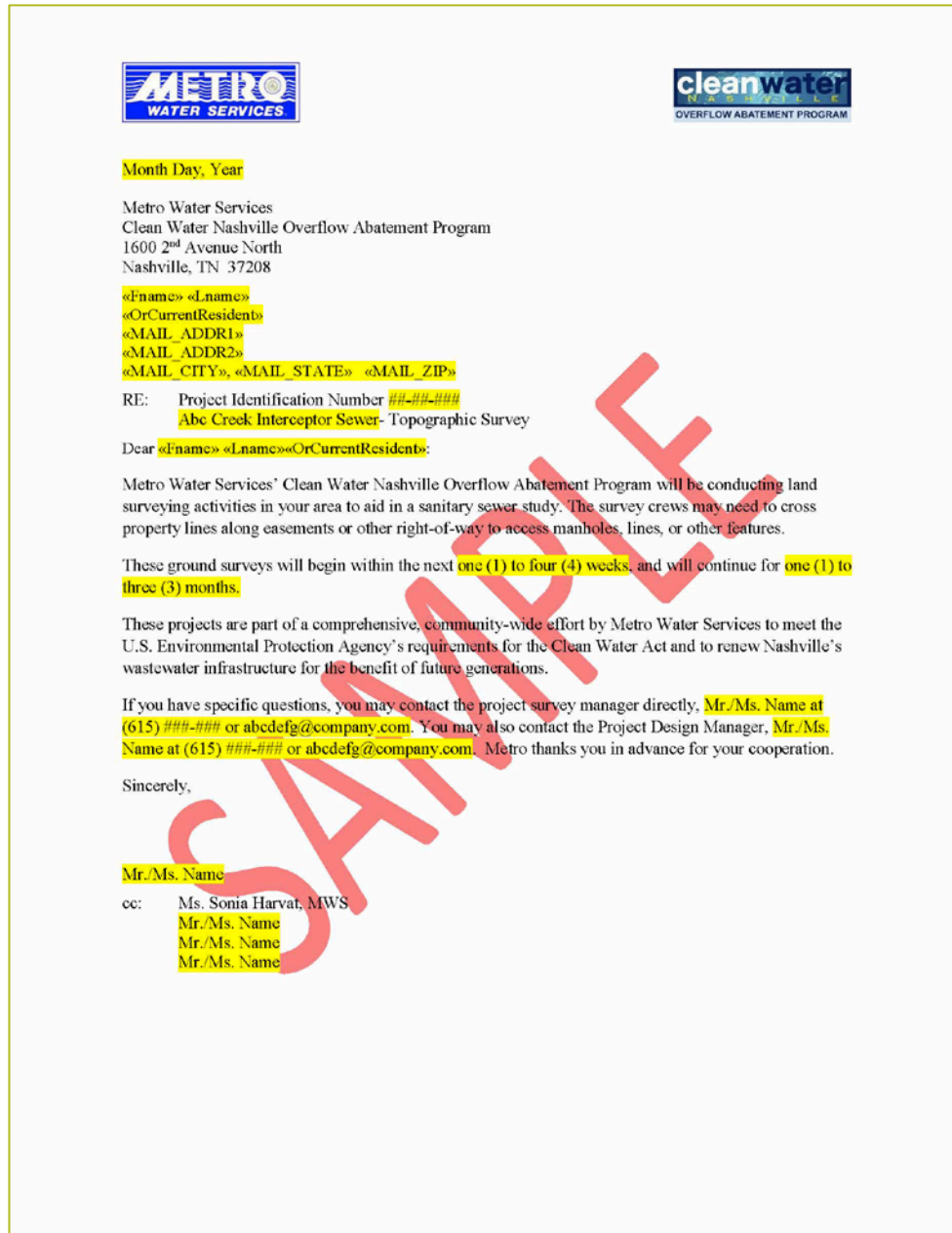


Figure 5-1 Sample Property Owner Notification Letter