



STATE OF NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION

ROY COOPER  
GOVERNOR

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SECRETARY

April 18, 2017

To: Division Engineers, Division of Highways  
Unit Heads, Technical Services

From: Mr. Mike L. Holder, PE  
Chief Engineer, Division of Highways

Subject: Mapping Requirements for Transportation Facility Plans

The following concerns have been expressed by the NC Board of Examiners for Engineers and Surveyors (NCBEES) regarding NCDOT highway and Secondary Road plans:

1. Lack of public availability of plans for NCDOT land acquisition.
2. Lack of metadata on plans, including coordinate system, control points set, and closures.
3. Complexity of plans (readability, alignments).
4. Lack of consistency in locating, documenting, and representing property boundaries.
5. Complexity of right of way deeds, based on station/offset.
6. Chain of responsible charge for the PLS doing survey/mapping work.
7. Proper monumentation of the right of way (not part of the committee discussion but as a result of conversation with NCBEES).

The Recommendations to address these concerns are as follows:

**Issue #1: Lack of public availability of plans for NCDOT land acquisition.**  
**Recommended Solution: Prepare and record maps for all property acquired by NCDOT through fee simple, easement, or condemnation proceedings.**

For property not contiguous with highway/secondary road projects (ex. wetland mitigation properties), this action would require the preparation and recordation of a map meeting the requirements of GS 47-30 (attached). This follows a statewide standard for public/private property acquisition.

For rights of way and easements acquired through fee or condemnation in association with a major or secondary road project (any project going through the Design-Bid-Build or Design-Build process), this would require preparation and recordation of plans. These plans would need to meet certain criteria which will address the other items of concern as listed above.

For new secondary roads accepted onto the NCDOT system and not previously recorded, a set of plans showing as-built road features and as-acquired right of way (by easement

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agreement) should be prepared. These plans should meet the conditions stated in Issues 2, 3, 4, and 7 below.

**Issue #2: Lack of metadata on plans, including coordinate system, control points set, and closures.**

**Recommended Solution: Include basic metadata on all project plans (Sheets 1C-1 thru 1C-7 in attached “B-3159” plans).**

This metadata would be defined in the survey control sheets, and should include:

- 1) Horizontal and vertical datum used for project coordinates (datum description, Sheet 1C series of sheets – see attachments) with statement of localized (ground) distances,
- 2) North reference (Sheet 1C series – North Arrow),
- 3) Survey control points, with coordinates, established on each project, both in graphic and tabular form (Sheets 1C series),
- 4) Closure Report (Sheet 1C series) with RMSE of GPS controls set, Error of Closure for primary traverse points set,  
Note: RMSE and error of closure not included in the attached examples
- 5) Table of Centerline Alignments: Control Points (Sheet 1D series of sheets – see attachments; Final Alignments),
- 6) Table of Right Of Way/Permanent Easement points set (Sheets E series of sheets – see attachments).

Items 1-4 are typical procedures for most firms that perform survey work for NCDOT.

Items 5-6 are semi-automated functions using an mdl (Microstation Development Language) application developed by NCDOT and available to all in-house and private design/survey personnel.

**Issue #3: Complexity of plans (readability, alignments).**

**Recommended Solution: Provide a coordinate list for key points on projects, along with a separate set of plans showing existing topography, property and proposed rights of way and easements (new design removed).**

Items 5 and 6 above (tables of alignment controls and right of way/easement points) will greatly relieve the need to compute entire centerlines. Because any portion of the proposed right of way or design alignments can be isolated, this will reduce the complexity for private industry.

To address the readability, it is recommended that a separate set of “Right Of Way” sheets, including existing topography, property, centerline data, and proposed rights of way and easements (no design information) be developed and included in the plan/profile sheets that are recorded at the appropriate date. These R/W sheets would need to be signed and sealed by a Professional Land Surveyor.

To allow for property sales and development prior to construction, and to allow for public availability of Design-Build property acquisition prior to project completion, these RW sheets could be placed on a public site such as Connect NCDOT (<http://connect.ncdot.gov/>) at the time right of way is approved for purchase. These plans would be labelled as “Preliminary” and revised as necessary during the right of way acquisition phase.

**Issue #4: Lack of consistency in location, documentation, and representation of property boundaries.**

**Recommended Solution: Locate and document front property corners when found.**

When NCDOT realigns a road, existing centerlines may be obliterated. In many cases this may or may not be a property line. By inclusion of existing centerlines on plans, private surveyors can determine if in fact a centerline was a boundary, and where it was.

Note: NCDOT should not label this line as a boundary, only as existing centerline. (See Issue #2, Item #3)

During initial surveys, efforts should be made to locate and survey front property corners on all affected properties. This information should be shown on plans, with those corners accurately identified (EIP, Axle, etc.) and related to the appropriate centerline (ex., Sheet RW-6, properties of Bobby R. Callicutt and Richard Purvis, show existing iron pins found, tied to centerline with distance along an extension of the property lines).

**Issue #5: Complexity of right of way deeds, based on station/offset.**

**Recommended Solution: The above mentioned recommendations.**

NCDOT provides a metes and bounds description of property obtained for right of way on major projects. Secondary road rights of way may be defined by the road “*as built*.” Publicly available maps and deeds/easement agreements, with those items described above, will provide the property owner, surveyor, or other interested parties with the necessary information to understand the deeds.

**Issue #6: Chain of responsible charge for the PLS doing survey/mapping work.**

**Recommendation: A public facing web address or some other offer of public access, providing signed/sealed \*.PDF’s of the original mapping or survey reports provided.**

As a part of the process of developing base mapping for any project, the surveyor(s) and mapper(s) involved would be responsible to provide any required sealed \*.PDF’s of the CADD files and reports delivered. Once final mapping is compiled, \*.PDF’s of individual components would be made available through some publicly accessible source. The address per each project would be included in the notes on plans.

One option could be placing those on the Connect NCDOT site (<https://connect.ncdot.gov/>) as part of the project data. These files could include a complete set of base mapping compiled and signed/sealed by a PLS.

**Issue #7: Proper monumentation of the right of way/easement lines.**

**Recommendation: All right of way / permanent easement monuments will be placed by a PLS prior to construction, with concrete markers identified as “Witness Post” or similar to be placed later by others.**

As a part of the process of developing the “Right of Way” sheets for any project, a PLS will set proper monumentation prior to the time that the plans are recorded. This monumentation would be an iron pin and cap. For those Divisions still using concrete markers, the contractor would be responsible for providing a PLS supervising that placement of those concrete markers at the locations previously designated. That surveyor would then need to provide the Resident Engineer and Location & Surveys with a signed/sealed statement of the replacement of iron pin and cap with concrete monuments, as per general survey practices and procedures. One alternative would be the placement of

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a concrete “Witness Post” which can be placed alongside the previously set monument. This Witness Post may be placed by others, not under the supervision of a PLS.

These requirements should be followed on all projects involving right of way or land acquisition as of **July 1, 2017**, where plan sheets are not in existence. The Location & Surveys Unit has agreed to assist in implementation of these requirements. The Location & Surveys Unit will make available training in the necessary applications and procedures involved in meeting these requirements. Additionally, Location & Surveys personnel in each Division can assist in negotiating with any private firms as to scope and procedures.

Thank you for your time and consideration in this matter.

MLH/jdb

Attached:

- ❖ Fabricated Plan Sheets: B-3159, showing PLS statements, including:
  1. Cover Sheet
  2. Survey Sheets 1C-1 - 1C-4: Survey Control Data
  3. Survey Sheet 1-D: Proposed Alignment Data
  4. Survey Sheets 1E-1 - 1E-2: Right of Way and Permanent Easement Data
  5. Right Of Way Sheets RW1 Cover Sheet, RW4 - RW7
- ❖ Proposed Standard Index of Sheets for NCDOT Roadway Projects
- ❖ GS 47-30 (mapping law)
- ❖ Proposed 2017 House Bill H 501