

# GPS Calibration Report

## Project U-3301

| Project File Data |                               | Coordinate System |                                |
|-------------------|-------------------------------|-------------------|--------------------------------|
| TIP Number        | U-3301                        | Name:             | United States/State Plane 1983 |
| User              | Mark Parris, PLS              | Datum:            | Datum from Data Collector      |
| Modified:         | 4/13/2016 1:10:56 PM (UTC:-6) | Zone:             | North Carolina 3200            |
| Time zone:        | Eastern Daylight Savings      | Geoid:            | GEOID12A (Conus)               |
| Horizontal Datum  | US survey feet                | Vertical datum:   | NAD 88                         |
| Coordinate Units  | US survey feet                |                   |                                |
| Vertical Datum    | US survey feet                |                   |                                |

  

| Local Site Information |                  |
|------------------------|------------------|
| Localized around       | GPS3             |
| latitude:              | N35°38'44.23280" |
| longitude:             | W82°40'35.96454" |
| height:                | 1896.353 ft      |

The North Carolina Department of Transportation uses a **Localized Coordinate System** which is very similar to North Carolina Zone 3200 from which it is derived. **Please take care in utilizing these coordinates to eliminate confusion of the two systems.** This file is to aid in the use of Real Time Kinematic (RTK) GPS during construction layout.

## Site Calibration Report

### Horizontal Calibration Parameters

|                    |               |
|--------------------|---------------|
| Translation north: | -0.460 ft     |
| Translation east:  | -0.117 ft     |
| Rotation:          | 0°00'01"      |
| Origin northing:   | 707765.519 ft |
| Origin easting:    | 907605.094 ft |
| Scale factor:      | 1.0001857891  |

### Vertical Calibration Parameters

|                           |               |
|---------------------------|---------------|
| Vertical shift at origin: | 0.569 ft      |
| Slope north:              | 1.188 ppm     |
| Slope east:               | -5.818 ppm    |
| Origin northing:          | 700934.980 ft |
| Origin easting:           | 914292.369 ft |

## Residual Differences between GPS and Known Coordinates

### Summary

|                          | Maximum residual | Root Mean Square residual | Point     |
|--------------------------|------------------|---------------------------|-----------|
| <b>Horizontal</b>        | 0.104 ft         | 0.080 ft                  | 150_GNSS  |
| <b>Vertical</b>          | -0.051 ft        | 0.027 ft                  | 114_GNSS  |
| <b>Three-dimensional</b> | 0.099 ft         | 0.078 ft                  | GPS2_GNSS |

### Point Residuals

| WGS84 Coordinates |                  | Calculated Point       |               | Grid Point       |               |
|-------------------|------------------|------------------------|---------------|------------------|---------------|
| <b>Point</b>      | GPS1_GNSS        | <b>Point</b>           | GPS1_GNSS     | <b>Point</b>     | GPS1          |
| <b>Latitude</b>   | N35°39'24.86743" | <b>Northing</b>        | 714571.162 ft | <b>Northing</b>  | 714571.198 ft |
| <b>Longitude</b>  | W82°42'25.00199" | <b>Easting</b>         | 899078.142 ft | <b>Easting</b>   | 899078.177 ft |
| <b>Height</b>     | 2011.331 ft      | <b>Elevation</b>       | 2109.418 ft   | <b>Elevation</b> | 2109.400 ft   |
|                   |                  | <b>Vert. residual</b>  | 0.018 ft      | <b>Type</b>      | Vertical      |
| <b>Point</b>      | GPS2_GNSS        | <b>Point</b>           | GPS2_GNSS     | <b>Point</b>     | GPS2          |
| <b>Latitude</b>   | N35°39'35.45034" | <b>Northing</b>        | 715653.963 ft | <b>Northing</b>  | 715654.047 ft |
| <b>Longitude</b>  | W82°42'29.33631" | <b>Easting</b>         | 898760.645 ft | <b>Easting</b>   | 898760.623 ft |
| <b>Height</b>     | 2089.844 ft      | <b>Elevation</b>       | 2187.956 ft   | <b>Elevation</b> | 2187.910 ft   |
|                   |                  | <b>Horiz. residual</b> | 0.087 ft      | <b>Type</b>      | Horz and Vert |
|                   |                  | <b>Vert. residual</b>  | 0.046 ft      |                  |               |
|                   |                  | <b>3D residual</b>     | 0.099 ft      |                  |               |
| <b>Point</b>      | GPS3_GNSS        | <b>Point</b>           | GPS3_GNSS     | <b>Point</b>     | GPS3          |
| <b>Latitude</b>   | N35°38'44.23292" | <b>Northing</b>        | 710130.236 ft | <b>Northing</b>  | 710130.221 ft |
| <b>Longitude</b>  | W82°40'35.96545" | <b>Easting</b>         | 907918.682 ft | <b>Easting</b>   | 907918.756 ft |
| <b>Height</b>     | 1896.319 ft      | <b>Elevation</b>       | 1994.487 ft   | <b>Elevation</b> | 1994.520 ft   |
|                   |                  | <b>Horiz. residual</b> | 0.075 ft      | <b>Type</b>      | Horz and Vert |
|                   |                  | <b>Vert. residual</b>  | -0.033 ft     |                  |               |
|                   |                  | <b>3D residual</b>     | 0.082 ft      |                  |               |
| <b>Point</b>      | GPS4_GNSS        | <b>Point</b>           | GPS4_GNSS     | <b>Point</b>     | GPS4          |
| <b>Latitude</b>   | N35°38'44.15561" | <b>Northing</b>        | 710071.323 ft | <b>Northing</b>  | 710071.388 ft |
| <b>Longitude</b>  | W82°40'19.23738" | <b>Easting</b>         | 909298.230 ft | <b>Easting</b>   | 909298.205 ft |
| <b>Height</b>     | 1971.603 ft      | <b>Elevation</b>       | 2069.793 ft   | <b>Elevation</b> | 2069.760 ft   |
|                   |                  | <b>Horiz. residual</b> | 0.069 ft      | <b>Type</b>      | Horz and Vert |
|                   |                  | <b>Vert. residual</b>  | 0.033 ft      |                  |               |
|                   |                  | <b>3D residual</b>     | 0.077 ft      |                  |               |
| <b>Point</b>      | GPS5_GNSS        | <b>Point</b>           | GPS5_GNSS     | <b>Point</b>     | GPS5          |
| <b>Latitude</b>   | N35°37'15.69094" | <b>Northing</b>        | 700934.980 ft | <b>Northing</b>  | 700934.916 ft |
| <b>Longitude</b>  | W82°39'14.70106" | <b>Easting</b>         | 914292.369 ft | <b>Easting</b>   | 914292.325 ft |
| <b>Height</b>     | 2113.798 ft      | <b>Elevation</b>       | 2211.859 ft   | <b>Elevation</b> | 2211.870 ft   |
|                   |                  | <b>Horiz. residual</b> | 0.078 ft      | <b>Type</b>      | Horz and Vert |
|                   |                  | <b>Vert. residual</b>  | -0.011 ft     |                  |               |
|                   |                  | <b>3D residual</b>     | 0.079 ft      |                  |               |

|                  |                  |                        |               |                  |               |
|------------------|------------------|------------------------|---------------|------------------|---------------|
| <b>Point</b>     | GPS6_GNSS        | <b>Point</b>           | GPS6_GNSS     | <b>Point</b>     | GPS6          |
| <b>Latitude</b>  | N35°37'24.65762" | <b>Northing</b>        | 701826.615 ft | <b>Northing</b>  | 701826.592 ft |
| <b>Longitude</b> | W82°39'09.93114" | <b>Easting</b>         | 914719.305 ft | <b>Easting</b>   | 914719.227 ft |
| <b>Height</b>    | 2105.992 ft      | <b>Elevation</b>       | 2204.084 ft   | <b>Elevation</b> | 2204.180 ft   |
|                  |                  | <b>Horiz. residual</b> | 0.081 ft      | <b>Type</b>      | Horizontal    |
| <b>Point</b>     | 100_GNSS         | <b>Point</b>           | 100_GNSS      | <b>Point</b>     | 100           |
| <b>Latitude</b>  | N35°39'22.39830" | <b>Northing</b>        | 714367.820 ft | <b>Northing</b>  | 714367.817 ft |
| <b>Longitude</b> | W82°42'39.97773" | <b>Easting</b>         | 897833.705 ft | <b>Easting</b>   | 897833.752 ft |
| <b>Height</b>    | 2020.962 ft      | <b>Elevation</b>       | 2119.012 ft   | <b>Elevation</b> | 2119.030 ft   |
|                  |                  | <b>Horiz. residual</b> | 0.047 ft      | <b>Type</b>      | Horz and Vert |
|                  |                  | <b>Vert. residual</b>  | -0.018 ft     |                  |               |
|                  |                  | <b>3D residual</b>     | 0.050 ft      |                  |               |
| <b>Point</b>     | 106_GNSS         | <b>Point</b>           | 106_GNSS      | <b>Point</b>     | 106           |
| <b>Latitude</b>  | N35°39'19.11793" | <b>Northing</b>        | 713976.679 ft | <b>Northing</b>  | 713976.637 ft |
| <b>Longitude</b> | W82°42'20.62891" | <b>Easting</b>         | 899417.106 ft | <b>Easting</b>   | 899417.093 ft |
| <b>Height</b>    | 2000.619 ft      | <b>Elevation</b>       | 2098.697 ft   | <b>Elevation</b> | 2098.690 ft   |
|                  |                  | <b>Horiz. residual</b> | 0.045 ft      | <b>Type</b>      | Horz and Vert |
|                  |                  | <b>Vert. residual</b>  | 0.007 ft      |                  |               |
|                  |                  | <b>3D residual</b>     | 0.045 ft      |                  |               |
| <b>Point</b>     | 146_GNSS         | <b>Point</b>           | 146_GNSS      | <b>Point</b>     | 146           |
| <b>Latitude</b>  | N35°37'49.44120" | <b>Northing</b>        | 704470.097 ft | <b>Northing</b>  | 704470.147 ft |
| <b>Longitude</b> | W82°39'55.60790" | <b>Easting</b>         | 911043.075 ft | <b>Easting</b>   | 911043.147 ft |
| <b>Height</b>    | 2123.811 ft      | <b>Elevation</b>       | 2221.891 ft   | <b>Elevation</b> | 2221.860 ft   |
|                  |                  | <b>Horiz. residual</b> | 0.087 ft      | <b>Type</b>      | Horz and Vert |
|                  |                  | <b>Vert. residual</b>  | 0.031 ft      |                  |               |
|                  |                  | <b>3D residual</b>     | 0.092 ft      |                  |               |
| <b>Point</b>     | 153_GNSS         | <b>Point</b>           | 153_GNSS      | <b>Point</b>     | 153           |
| <b>Latitude</b>  | N35°37'34.59989" | <b>Northing</b>        | 702994.226 ft | <b>Northing</b>  | 702994.277 ft |
| <b>Longitude</b> | W82°40'03.45025" | <b>Easting</b>         | 910340.625 ft | <b>Easting</b>   | 910340.668 ft |
| <b>Height</b>    | 2105.300 ft      | <b>Elevation</b>       | 2203.328 ft   | <b>Elevation</b> | 2203.340 ft   |
|                  |                  | <b>Horiz. residual</b> | 0.067 ft      | <b>Type</b>      | Horz and Vert |
|                  |                  | <b>Vert. residual</b>  | -0.012 ft     |                  |               |
|                  |                  | <b>3D residual</b>     | 0.068 ft      |                  |               |
| <b>Point</b>     | 161_GNSS         | <b>Point</b>           | 161_GNSS      | <b>Point</b>     | 161           |
| <b>Latitude</b>  | N35°37'14.26030" | <b>Northing</b>        | 700815.677 ft | <b>Northing</b>  | 700815.727 ft |
| <b>Longitude</b> | W82°39'23.01425" | <b>Easting</b>         | 913601.105 ft | <b>Easting</b>   | 913601.184 ft |
| <b>Height</b>    | 2065.778 ft      | <b>Elevation</b>       | 2163.821 ft   | <b>Elevation</b> | 2163.810 ft   |
|                  |                  | <b>Horiz. residual</b> | 0.094 ft      | <b>Type</b>      | Horz and Vert |
|                  |                  | <b>Vert. residual</b>  | 0.011 ft      |                  |               |
|                  |                  | <b>3D residual</b>     | 0.094 ft      |                  |               |