

STATE OF OKLAHOMA  
DEPARTMENT OF TRANSPORTATION  
SURVEY DIVISION

## SPECIFICATIONS FOR ODOT SPATIAL DATA TESTING

January 2024

### OBJECTIVE

- Implementation of a statistical and testing methodology for estimating the vertical and horizontal accuracy of Digital Terrain Models designed to prevent costly earth volume overruns, and ensure that new technologies associated with Lidar meet horizontal standards. Testing is done with respect to geo-referenced ground positions of higher accuracy, following guidelines as defined by the Federal Geographic Data Committee's publication "Geospatial Positioning Accuracy Standards, Part 3: National Standard for Spatial Data Accuracy", (NSSDA).
- The ODOT Standard for Spatial Data Accuracy, hereinafter called OSSDA Testing, will focus on vertical as well as horizontal accuracy. The vertical testing will only incorporate random point locations that do not fall at triangle vertices; (i.e. interpolated surface test).
- OSSDA Testing will incorporate a second testing procedure for horizontal accuracy. This second test will occur after the fact at well-defined locations to be verified by field check.

### I. OSSDA TESTING CRITERIA (VERTICAL TESTING)

The OSSDA testing criteria specifies a minimum of 24 check points, (1 mile project or less), evenly distributed throughout the project, as defined in attachment A3 of the Contract. These points are to be checked against points of higher accuracy. The root mean square error, (RMSE), will be calculated for the total set of check points. This value is essentially the same as the Standard Deviation of the Set of measurements. The testing will be done at the 95% confidence level, which equates to 2 standard deviations, (total RMSEx1.96), also referred to as "2 Sigma".

**Note: The pass/fail threshold shall be 0.04 feet @ 2 Sigma.**

## II. OSSDA TESTING CRITERIA (HORIZONTAL TESTING)

To verify by standard field procedures, the horizontal position of 24 well defined locations per project. Because RMSE<sub>x</sub> will not be equal to RMSE<sub>y</sub>, the testing will be done by the circular method  $\sim 2.477 * 0.5 * (RMSE_x + RMSE_y)$ .

**Note: The pass/fail threshold shall be 1.0 feet A 2 Sigma.**

## III. FIELD SURVEY CREW AND/OR SELECTED CONSULTANT RESPONSIBILITIES (VERTICAL TESTING)

### A. SCOPE

To collect at the time of control target placement, a system of OSSDA check points at a rate of approximately 12 points per mile and in 20 point increments with a 4 point contingency, (to compensate for points that may fall off the surface, and/or become outliers, example: 24, 44, 64, etc.), as needed and relative to the length of the project, and again, adhering to a minimum of twenty four points and a maximum of one hundred and four points per project, unless otherwise specified by The Department.

### B. ACCURACY

OSSDA check points shall have the same accuracy as the targeted control as defined in the latest version of the "ODOT SURVEY DIVISION SURVEY SPECIFICATIONS FOR SURVEYS FOR PRIMARY AND SECONDARY HIGHWAYS".

#### GENERAL EXPECTATIONS:

HORIZONTAL ACCURACY: 0.10  
VERTICAL ACCURACY: 0.05

### C. COLLECTION

Any approved means for tying targets will be acceptable collection procedure for establishing OSSDA check points, as long as the point has been collected and accurately verified by a second reading. This may be accomplished utilizing any combination of the acceptable means of collecting photo control:

1. Total Station
2. Real-Time Kinematic GPS (RTK)
3. ODOT RTN Network

**Note:** If Total Station or RTK alone is used, shots from 2 distinct setups, from 2 different control points, will be required. If RTN alone is used, 2 shots separated by at least 3 hours on a given day will be required, (example: One in the morning and one in the afternoon), to achieve 2 different satellite configurations.

#### D. PLACEMENT (Vertical Points)

OSSDA vertical check points should reflect all types of terrain encountered within the project limits and as defined by the targeted control, by percentage. In urban areas for example, a large percentage will surely fall on paved surfaces, compared to rural areas where pavement would comprise only a small percentage of the total area and cultivation, perhaps, the majority. To be able to adequately critique the entire surface, 20 percent of these points shall be placed 200-250 feet from the project centerline, except in urban areas where procedure dictates that the mapping corridor be narrowed to 300 feet total, (150 feet from centerline). As roadbed and back slopes represent a certain percentage of each and every project, they are acceptable by percentage as OSSDA check points. Special care however, must be taken on these and similar situations where a small horizontal error could cause a significant error in elevation.

#### E. DELIVERABLES (ODOT Field Survey Crew, and or selected Consultants)

The Field Survey Crew will provide the following items directly to ODOT Aerial Survey Branch:

1. A completed OSSDA Check Point file using the provided “OSSDA Vertical Field Submittal Form for Aerial Projects” in Microsoft Excel file format, listing the true xyz values for the OSSDA points at each occupation and their average.
2. A detailed description of the procedure used to establish the OSSDA points.

### IV. **FIELD SURVEY CREW AND/OR SELECTED CONSULTANT RESPONSIBILITIES (HORIZONTAL TESTING)**

#### A. SCOPE

To verify by standard field procedures, the horizontal position of 24 well defined locations, per project as selected by Aerial Survey Branch personnel.

#### B. DELIVERABLES (Field Survey Crew)

1. A completed OSSDA Check Point file using the provided “OSSDA Horizontal Field Submittal Form for Aerial Projects” in Microsoft Excel file format, listing the true xy values for the OSSDA points at each occupation and their average.

**V. AERIAL SURVEY BRANCH RESPONSIBILITIES**

All Consultant submitted DGN files will be reviewed by ODOT Aerial Survey Branch. they will be critiqued for completeness and accuracy as well as level/linestyle violations. The planimetric data will be subjected to OSSDA horizontal testing procedures, and the Terrain model will be subjected to OSSDA vertical testing procedures as defined in attachment A3 of the Contract. If deemed necessary, they will be returned for corrections by the Consultant. All consultant files as submitted will also be placed in a consultant folder in srvarch.