

STATE OF OKLAHOMA
DEPARTMENT OF TRANSPORTATION
SURVEY DIVISION

Survey Specifications for Primary and Secondary Highways

January, 2024

PREFACE

NOTE: The Specifications, and all forms noted in this document can be downloaded from the ODOT Website at: <https://oklahoma.gov/odot/about/contact-us/survey.html> .

This survey shall meet the requirements described in OKLAHOMA ADMINISTRATIVE CODE, 245:15, Subchapter 13 (Minimum Standards for Land Surveying) and Subchapter 21, which includes the complete text of **Oklahoma Statute Title 65:3 – 119** (Corner Perpetuation and Filing Act) as adopted by the Oklahoma State Board of Licensure for Professional Engineers and Land Surveyors, (latest effective version at the time of survey).

These Specifications are written for projects utilizing the United States Survey Foot as the unit of measurement.

For each specific project, additional requirements and/or amendments to these specifications may be provided by the Oklahoma Department of Transportation's, Survey Division (ODOT, Survey Division), and shall be covered by **Survey Special Provisions** written at the time of contract negotiation and/or during the survey scope definition.

I. GENERAL

- A. The scope and coverage of the field survey to be accomplished are as necessary to prepare Functional, Right of Way, and Construction Plans.
- B. All field surveys, computer files, and other documents shall be complete in every respect, and the information shall be set forth in a professional manner, as depicted in examples at the following location: <https://www.odot.org/survey/surveyInternet/cpeexamples.htm>.
- C. Any discrepancy between newly acquired and existing survey data must be brought to the attention of ODOT, Survey Division, for resolution, including plans, section corners, previous surveys, horizontal or vertical control, or other items.
- D. Any issues regarding adherence to the Specifications, or the Survey Special Provisions must be brought to the attention of ODOT, Survey Division, for resolution.

- E. When available at the outset of GPS data collection, Consultant shall utilize the ODOT RTN for data collection.

II. CONTROL

A. GENERAL

1. The Professional Land Surveyor (PLS) shall prepare Survey Division Form 11(SD 11'S) for all Control Monuments used to complete the survey. All primary control points require an ODOT number obtained from ODOT Survey Division unless already assigned. Monuments for primary control will be durable, and set solidly. Monuments shall contain ferrous material to allow location with magnetic locators. Acceptable monuments include, but are not limited to iron pins at least ½" in diameter, brass or aluminum caps set on iron pins or in concrete, feno markers, etc.
2. Participation in the NGS program "GPS on Bench Marks" is required on all Surveys, unless stated in the Survey Special Provisions. Procedures and the data collected will meet and be submitted to NGS and ODOT Survey Division following NOAA/NGS guidelines as described on the NGS website at <https://geodesy.noaa.gov/GPSonBM/> ODOT Survey Division requirements for GPS on Bench Marks (BM) are as follows:
 - a. BMs must be physically occupied, no offsets
 - b. One benchmark occupation per project in accordance with NGS's GPS on Benchmarks map, located at: <https://arcg.is/0L15yO0>
 - c. A copy of the NGS submittal and acceptance will be provided to ODOT Survey Division in the Final Submittal of the project
3. ACCURACY: there are two distinct accuracies for Horizontal and Vertical Control:
 - a. Network Accuracy: Accuracy that is relative to the National Geodetic Survey (NGS) Continuously Operating Reference Stations (CORS).
 - b. Local Accuracy: Accuracy that is relative to the specific project itself.
 - c. Both accuracies will be expressed as Circular Root Mean Square Error (RMSE) at 2 Sigma (95% Confidence). These accuracy definitions are currently used by the National Geodetic Survey, and are better suited to modern three-dimensional survey control networks than the older, Linear Accuracy definitions (1st Order, 2nd Order, etc.).

B. HORIZONTAL CONTROL

1. The survey is to be placed on the current NGS Oklahoma State Plane Coordinate System, NAD83(2011) or the latest iteration, unless prior approval is granted by ODOT Survey Division to use a different horizontal datum.
2. Primary Control will be derived from a fully constrained, three-Dimensional Static GPS Network Adjustment, utilizing a minimum of three NGS CORS and any published passive monuments within 5 miles of the project. To ensure the highest accuracy, the Network will be fully constrained vertically, by inclusion of at least 4

acceptable bench marks (The CORS in the Network Adjustment are acceptable as bench marks). These may be Published NGS or USGS Monuments, or may be taken from previously completed ODOT Projects, as approved (in advance) by ODOT, Survey Division.

3. OPUS Double Solutions may be used for project control in some instances, **with prior approval by Survey Division**. Double OPUS Solutions shall be obtained on each control point using occupations on different days, different times of day, offset by at least 4 hours.
4. ODOT's Real-Time Network can be used to establish control, where applicable, while adhering to the following:
 - a. Set data collector to shoot and an average 30 shot session at a minimum.
 - b. Occupy point with a rod stabilized using a Bipod or Tripod.
 - c. Shoot sessions at different times of day.
 - d. Average at least 4 sessions for your final results.
 - e. Check your final results with a 2-hour OPUS solution.
 - f. Note on your SD11's control was established utilizing ODOT RTN.
 - g. Continue to use the RTN for your field work and your established control points as your "check in"
 - h. To maintain and document the accuracy of the ODOT RTN over its coverage area we require a spread sheet stating type of Monument, Published Monument Name, Published X, Y & Z and collected X, Y & Z, for each project the RTN is used, at the beginning and conclusion of the project. A sample spreadsheet has been included in the Consultant Pack. Other spreadsheets are acceptable, provided they contain the required information.

Note: For access to ODOT RTN contact Survey Division Support Branch at 405/521-2621 or E-mail SDinfoRequest@odot.org

5. The Horizontal Control shall meet or exceed the following accuracy criteria:
 - a. NETWORK ACCURACY: 0.10 FOOT
 - b. LOCAL ACCURACY: 0.05 FOOT

C. VERTICAL CONTROL

1. NETWORK VERTICAL CONTROL:

- a. Vertical Control Datum will be NAVD 88, derived from the vertical component of the three-dimensional GPS Control Network, previously described.
- b. Vertical Control will be tied to published passive monuments that include a vertical component within the project limits, or as directed by Survey Division.

2. LOCAL VERTICAL CONTROL:

- a. Direct Differential Leveling will be used to establish local bench mark elevations along the project. At a minimum, this will consist of the mean of two distinct runs, or level loop which include all primary control points. The unadjusted vertical differences between intermediate bench marks, for each Level Run, are to be shown in the Check Levels and Bench Mark List. The Adjusted Elevations for each bench mark will be derived by distributing the error between Source Bench Marks, equitably along the entire length of the Level Loop, with each

- intermediate bench mark receiving a proportional share of the error. Adjusted Elevations will be the source for all Digital Terrain Modeling, and Topography.
- b. In towns, bench marks shall be set not greater than one block (or 300 feet) apart, and in rural sections bench marks shall be set approximately 700 feet apart, where practical. A bench mark will be set on each cross-drain structure. A permanent bench mark will be set on, or outside the anticipated Right of Way, approximately each quarter mile, where practical.
 - c. Examples of acceptable bench marks include the following: X cut in concrete. 80d or larger nails or railroad spikes in trees or survey monument set in concrete. NOTE: Utility poles and fence posts are not to be used as benchmarks.
 - d. All primary control points will be included in all level runs.
 - e. In areas with sufficient coverage of ODOT's RTN, the above benchmark requirements may be waived in lieu of densified primary control established with the RTN, at the direction of Survey Division.
3. The Vertical Control shall meet or exceed the following accuracy criteria:
 - a. NETWORK ACCURACY (FROM GPS OR LEVELING): 0.10 FOOT
 - b. LOCAL ACCURACY (CONFIRMED BY LEVELING): 0.02 FOOT
 4. The following Survey Control Data notation is contained in the ODOT, Survey Division OpenRoads Designer® File Standard, as part of the first Survey Data Sheet. This notation must appear on the Survey Data Sheets and on the title sheets of Functional, Right of Way, and Construction plans:

SURVEY CONTROL DATA

1. HORIZONTAL CONTROL:
 - a. Horizontal control for this survey is the NGS Oklahoma State Plane Coordinate System, NAD83(2011), (**North or South Zone**). *
 - b. ESTIMATED NETWORK ACCURACY – North: **0.07** Ft. East **0.07** Ft. Ellipsoid: **0.10** Ft.
 - c. LOCAL ACCURACY (CONFIRMED BY RTK OR ODOT's RTN) – North: **0.07** Ft., East **0.07** Ft., Ellipsoid: **0.10** Ft. (Note these values are the maximum allowable Root Mean Square Error (RMSE) at the 95% Confidence Level. Actual values will vary by project).
2. BEARINGS:

The bearings shown herein or hereon are grid bearings derived from the NGS Oklahoma State Plane Coordinate System and are not Astronomical. The angle of variance between Grid North (GN) and the astronomical True North (TN) is depicted diagrammatically.
3. VERTICAL CONTROL:
 - a. Level datum is NGS, NAVD 88 (specify GEOID model used for this project to derive orthometric heights)
 - b. ESTIMATED NETWORK ACCURACY:

GPS Network Adjustment -or- OPUS Projects -or- GPS Double OPUS Solution -
or- Direct Differential Leveling, Double Loop: **0.10 Ft.**

- c. LOCAL ACCURACY: Direct Differential Leveling (through the length of the project):
0.02 Ft.

Note: These values are the maximum allowable Root Mean Square Error (RMSE) at the 95% Confidence Level. Actual values will vary by project.

*Project specific. Show only that which applies.

III. CENTERLINE/ALIGNMENT

- A. Surveys along an existing highway must use the Centerline of the Highway, as re-established from existing ODOT Surveys or Highway Plans. A careful examination of those documents, including the recovery of monuments and/or Reference Points, is essential to the accurate establishment of the Highway Centerline. Bridges and other massive drainage structures depicted on the plans may also be used to determine the exact location of the Centerline of the Highway. Note that the Centerline of Highway may, **or may not** be coincident with the Centerline of the Existing Paving, or with the Section Line. Right of Way markers should only be used as a last resort.
- B. Survey centerline stationing shall run from South to North and from West to East, where practical. This will generally be consistent with the direction of the Control Section for the highway.
- C. Stations are established at even 100-foot increments from a designated Point of Beginning. Stationing for Points on Tangent (POT's), Points of Intersection (PI's), Points of Curvature (PC's), Points on Sub-Tangent (POST's), and other controlling points on the alignment shall be defined.
- D. All Highway Centerline circular curves shall be computed on the arc definition based on the length of the radius, unless directed otherwise by Survey Division. Spiral curves shall be computed using plans curve information, unless directed otherwise by Survey Division.
- E. Existing curves which were originally defined by the radius of curve using Metric (SI) units of measurements will be converted by a straight mathematical conversion of the radius value, then rounded to the nearest degree of curve divisible by four (4), i.e., 1°15'00", 2°30'00", etc. The curve data will then be recomputed based on the converted degree of curve.
- F. The intersection points of the Centerline of Survey with all Section Lines and Quarter Section Lines shall be calculated. Those points shall be monumented and referenced where practical. In addition to the Reference Point information, these points of intersection shall have the following shown; stationing and distances each direction to the land corners.

- G. All P.O.T.'s, P.I.'s, P.C.'s, P.T.'s, and P.O.S.T.'s or any other principal control point shall be calculated and shall be monumented where practical. Acceptable monumentation include iron pins, approved monuments or well-defined crosses cut in concrete and shall be referenced whether physical or virtual. In no instance will wooden stakes be accepted. The distance between Centerline control points shall be approximately 1,000 to 1,500 feet, where practical.
- H. Reference points shall be set and described so as to make them as easily recoverable as possible. All reference points for survey monuments shall be of a permanent nature, such as a #4 rebar/iron pin, "x" on concrete walk, approved monument, R.R. spike in a tree or any accessible permanent object with a precise measuring point. A minimum of three reference points shall be set on each point referenced and arranged so that, at least two of the reference points shall fall on a true line passing through the point being referenced where practical, either by both reference points being on the same side or on both sides, with the angle from the line or lines to be as great as practical (near perpendicular to one another, for maximum strength of figure). The first reference point shall be set a minimum of 100 feet from the Centerline of Survey, where practical. Subsequent points shall be no more than 100 feet apart. If possible, at least two reference points should be set beyond the anticipated Right of Way Lines so they will not be disturbed or destroyed by construction. All points and reference points set in cultivated fields shall be buried a minimum of 12" deep. Bearings and distances shall be shown between all reference points and the points they are referencing.

IV. TOPOGRAPHY

- A. In urban or platted areas all topography shall be obtained for a minimum of one-half block on both sides of the centerline of survey or approximately 150 feet. In rural areas all topography within 200 feet shall be obtained. In addition, any other topography that might affect the acquisition of Right of Way or the preparation of the plans shall be obtained. Typical examples are homes or businesses that are located beyond the normal distance that topography is obtained. If there is an existing driveway, used to access to such structures, then the buildings must be located and identified in the survey.
- B. Topography to be located/identified includes, but is not limited to; existing paving, roads, trails, bridges/drainage structures, utility lines, buildings, driveways, gates/field entrances (show width of gates), mail boxes, gas pumps, storage tanks (both above and below ground), and any other manmade cultural or topographic feature that might affect proper design and/or impact Right of Way acquisition.
- C. If any topographic features are discovered during the course of the survey, that are suspected to be of historical, archaeological, or cultural significance, such as Native American Graves, or other evidence of occupation by prehistoric peoples, notification must be sent immediately to ODOT's Environmental Programs Division, so they can investigate the site in question. **At no time** will such sites be depicted on the Survey Data Sheets. In the Historical Letter and Written Report, they should be described as **"Potential Cultural Resource Sites"** with **no specific information** given, as to the exact location or nature of the sites.

- D. Areas such as private dumps, underground fuel storage tanks, etc. should be identified on the Survey Data Sheets as “**Potential Environment Contamination**”. Specific details of these sites are to be included in the Historical Letter and Written Report.
- E. Centerline profile and edge of pavement shots will be a maximum of 25 feet apart.
- F. All data collected with aerial lidar, mobile lidar, drone, or any method other than conventional field methods (e.g., RTK, total station, etc.) shall be tested and certified to meet the OSSDA horizontal accuracy standard, as per document Specification for ODOT Spatial Data Testing.

V. **TERRAIN MODELING**

- A. In urban or platted areas Terrain Model data shall be taken to a minimum of one-half block on both sides of the centerline of survey or approximately 150 feet. In rural areas the terrain model shall be taken to 200 feet right and left of the centerline of survey or to a minimum of 50 feet beyond the proposed new right-of-way lines, whichever is greater.
- B. For Roadway-Size Drainage Structures (culverts less than 20 feet in length), a separate flowline profile (3 dimensional breakline depicting horizontal and vertical location) of the stream shall be obtained for a distance of 500 feet upstream and downstream.
- C. For Bridge-Sized Structures with floors (Double 10-foot culverts or larger) flowline profiles will be obtained for a distance of 1000 feet upstream and downstream.
- D. For Bridge-Sized Structures without floors, flowline profiles will be obtained for a distance of 500 feet upstream and downstream.
- E. Intervals between individual readings will be a maximum of 25 feet for the first 150 feet, then 50 feet beyond, with care being taken to obtain readings at significant horizontal breaks or vertical “head-cuts” in the flowline.
- F. From a minimum of 500 feet before, to 500 feet after bridge locations (structures 20 feet or longer), DTM and Topographic Data will be extended to a minimum of 500 feet right and left of centerline of survey.
- G. For all crossing drainage structures, the banks and toes shall be located for a distance of 500 feet upstream and downstream.
- H. At Section Line Road or other road crossings, the DTM and topography limits will be extended to a distance of 500 feet on each side of the Centerline of Survey, beginning 150 feet before the crossing, and extending 150 feet after the crossing.
- I. On skewed Section Line Road Crossings, the DTM and topography limits will be 500

feet on each side of the Centerline of Survey, beginning 500 feet before the crossing, and extending 500 feet after the crossing.

- J. Where the survey crosses existing State or Federal projects (highways), complete surveys shall be made on the alignment of the crossing project for not less than 500 feet on each side of centerline of survey with profiles of the paving and road ditches extending a minimum of 1,000 feet on each side of the Main Centerline of Survey.
- K. In Urban Areas, at Street Intersections, breaklines shall be obtained at the Centerline of Streets, edges of paving, and ditch flowlines, for a distance of one block, or 300 feet, whichever is less. Additionally, if curbs are present, breaklines will be obtained on tops of curbs, and in gutters lines, for not less than one block or 300 feet, whichever is less.
- L. All data collected shall be tested and certified to meet the OSSDA vertical accuracy standard, as per document Specification for ODOT Spatial Data Testing.

VI. UTILITIES

- A. All public and privately owned utility lines and facilities, both overhead and underground, shall be located to SUE Quality Level B, to a minimum of 200 feet right and left, or to the limits of the topography and DTM. This information will include the location, size, type material, approximate depth, and ownership with name, address, and telephone number of owners.
- B. All utilities will be shown at zero elevation, with the exception of the following:
 - 1. Elevations shall be shown on low-wires of overhead utilities crossing Centerline of Survey. A graphic depiction of the swag of the low-wire shall be shown only on high tension lines.
 - 2. Elevation of tops of rims and flowlines shall be shown on storm sewer and sanitary sewer manholes that fall within the limits of the topography and DTM. On crossings, inlets and outfalls shall be located, with elevations, right and left of centerline, to the first manhole beyond the limits of the topography and DTM.
- C. The source of utilities information shall be denoted in the Survey Data Sheets, whether located by the owning company, or by a contracted locating company, or by other means.

VII. LAND SURVEYS

- A. All work pertaining to Land Survey points that are calculated, monumented, or otherwise used in the survey will be performed under the responsible charge and direct supervision of a Professional Land Surveyor (PLS) licensed in the State of Oklahoma.
- B. The PLS shall file Oklahoma Certified Corner Records for all Public Lands Survey

System Corners used to complete the survey. Copies of said documents are to be submitted to the Survey Division, in digital (Adobe .PDF) format. The PLS shall also sign and seal the Survey Data Sheets as required by these specifications or Survey Special Provisions.

- C. All Public Lands Survey System (PLSS) Sections crossed by the Centerline of Survey and /or from which Right of Way is to be acquired, shall be completely bounded and all Section Corners and Quarter Section Corners shall be duly recovered or remonumented, as necessary. Mathematical Ties shall be made in both directions from the Centerline of Survey, and distances will be shown to the nearest Section Corner and Quarter Section Corner. All Section Corners and Quarter Section Corners monumented or found in place shall be referenced by a minimum of three Reference Points, as required by the Corner Perpetuation and Filing Act. A detailed diagram, depicting the Corner Monuments and their associated Reference Points will be shown on the Survey Data Sheets. The size and type of monument will be described in detail. A brief narrative, describing the history and pedigree of each corner, as well as justification for using a particular corner location will also be shown. The same is to apply to Original GLO/BLM/USGS Survey Meander Lines and Corners and all Original Government Survey Subdivision Lines and Lot Lines.
- D. All non-original corners shall be set in accordance with the Bureau of Land Management's "Manual of Surveying Instructions" (Revised: 2009).
- E. All unplatted property ownership boundaries shall be accurately determined, based on a combination of Record Evidence and Field Evidence, with points calculated (not monumented) at the intersection with the Centerline of Survey.
- F. Land Lines crossing centerline curves will have the Point on Sub-Tangent (POST) as well as the Point on Curve (POC) calculated.
- G. All Original Townsites and platted Subdivision Boundaries shall be accurately determined. All Lots and Blocks within or adjacent to the Existing Right of Way limits shall be closed by a complete boundary, with corners calculated to a minimum of one block either side of the Survey Centerline.
- H. POT's, POC's, PI's or POST's, shall be calculated for the centerline of all streets intersecting the Survey Centerline (not monumented).
- I. All corners that require a Certified Corner Record filing requires an ODOT number obtained from ODOT Survey Division unless already assigned.

VIII. DRAINAGE

- A. Divide Lines for all drainage areas shall be determined by field ties, or obtained from aerial photographs, existing topographic maps and/or United States Geological Survey (USGS) topographic maps or approved online sources (e.g., Streamstats).

- B. Drainage information shall include sufficient information to determine the runoff by the Rational method as set out in current Oklahoma Department of Transportation Design Policy. Typically, the following drainage information will be required:
 - 1. Drainage Areas of 3 acres to 1500 acres
 - a. Complete Rational Data
 - b. Extreme high-water elevation and historical information
 - 2. Drainage Areas larger than 1500 acres
 - a. Ravine sections, if required by the ODOT Hydraulic Engineer, will be defined in the Survey Special Provisions.
 - b. Extreme high-water elevation and historical information
- C. Extreme high-water elevations shall be taken for all bridge structures and other major streams. Extreme care shall be taken in obtaining this information the location shall be shown where the reading was taken, (Bridge Seat, visible drift, or other spot delineated by witnesses), date on which the high-water Event occurred and the source of information. If the information is provided by a local resident, the name and address of the witness shall be shown.

IX. PROPERTY OWNERSHIPS AND RIGHT OF WAY

- A. In instances of non-typical circumstances related to properties or right of way, any documents pertaining to boundary disputes, court cases, unrecorded plats, or other Record Evidence will be submitted with the survey.
- B. Recorded deeds and easements shall be used in determining Existing Right of Way. Existing Highway Plans shall also be utilized as a supplemental source of information. Any conflicts between the two data sources should be discussed with ODOT, Survey Division, prior to completion of the project, with the goal of finding an equitable solution, agreeable to all parties.
- C. All public property ownership shall be identified and shown.

X. RAILROADS

- A. At all railroad crossings complete surveys shall be made on the railroads using the Railroad Alignment and Railroad Station Numbers for a distance not less than 500 feet on each side of Centerline of Survey. Terrain Model data shall extend to a minimum of 50 feet beyond the Railroad Right of Way Lines. A three-dimensional breakline of the top of each rail shall be obtained at intervals not to exceed 100 feet, to a minimum distance of 1,000 feet each side of Centerline of Survey.
 - 1. When a Railroad is parallel to the Survey Centerline, within the limit of the DTM, or

as specified in the Survey Special Provisions, elevations shall be obtained on the top of each rail at approximately 500-foot intervals.

2. The location, size and flowline profiles of all railroad structures shall be obtained;
 3. A typical section (side view) shall be obtained on all railroad bridges
 4. Railroad structures shall be described and tied to the Centerline of Survey.
- B. Where grade separations are proposed, survey width will need to be increased to enable the design of “shoo-fly” detours, including sufficient data for drainage computations, as detailed in the Special Provisions.

XI. SUBMITTAL

- A. SURVEY COMPUTER FILES: ODOT, Survey Division maintains OpenRoads Designer® Seed Files that have the Working Units and State Plane Coordinate System Parameters pre-defined at: <https://www.odot.org/survey/surveyInternet/cpexamples.htm> **these files must be used for all projects.** File naming, graphic cells, drawing level/layer names and placement, symbology, line weights, patterns, distances, bearings & labeling etc. are to comply with the ODOT CADD Standards. CADD data for this survey will be contained in a set of OpenRoads Designer®. DGN Files.
1. The Main DGN File (SWOXXXX_X_v1.dgn). This file will be a 2-Dimensional file. The file will have two major areas as follows:
 - a. Design Model: This portion of the file contains all points, lines and text associated with the survey, at the actual coordinate positions within the file. These items will be depicted using ODOT, Survey Division’s CADD Standards for each type of feature. Including:
 - i. the Centerline of Survey, controlling points, and reference points;
 - ii. all Original Government Survey Lines (Section Lines, Quarter Section Lines, Government Lot Lines, Meander Lines, etc.);
 - iii. platted subdivisions, City Lots, Blocks, & Streets;
 - iv. Corporate, City, County & State boundaries;
 - v. Public ownership;
 - vi. Highway, railroad & statutory Section Line rights of way;
 - vii. property lines;
 - viii. alignments of intersecting and adjacent highways and railroads;
 - ix. Station Equations,
 - x. Bearing Equations, and
 - xi. Elevation Equations
 - xii. Coordinate Geometry Points
 - xiii. Control Points & Bench Marks
 - xiv. Section Township and Range with Section Line Numerical Designation

All distances, bearings & labeling are to be depicted according to ODOT Survey Division CADD Standards.

- b. Sheet Models: This portion of the file will contain copies of the data from the Design Model, cropped to fit inside Standard Survey Data Sheet borders. Match Lines, Notes, and descriptive text will be added in this area to bring the sheets into compliance with ODOT Survey Division Standards and to ensure that the Survey Data Sheets are a stand-alone product, containing complete geometric information for reproducing the survey on the ground. Report sheets and Monument record sheets.
2. The Field Topo File (SWOXXXX_X_v1_TOPO.dgn), a 3-dimensional file, that contains all surface features needed to create a digital terrain model, manmade improvements, including roads, bridges, houses, signs, overhead and underground utilities, and other topographic features, along with the descriptive text associated with each item. This file must contain all field books. All features will be represented at elevation with the exception of:
 - a. Utilities except Sanitary Sewers/Storm Drains and overhead line crossings
 - b. Fences
 - c. Gates
 - d. Mailboxes
 3. The Aerial Topo File (SWOXXXX_X_v1_AERIAL.dgn), a 3-dimensional file, that contains all Aerial collected surface feature, if applicable.
 4. The Final Terrain Model (SWOXXXX_X_v1_FTM.dgn), a 3-dimensional file that contains Field Terrain and Aerial Terrain.
 5. The Drainage File (SWOXXXX_X_v1_DRA.dgn), a 2-dimensional file, that contains Drainage, Hydraulic Data and the following:
 - a. Location and description of cross-drains
 - b. Drainage Divide Lines (drawn as per the USGS Quadrangle for large areas; field checked on areas too small to be detected otherwise).
 - c. Drainage Areas (measured in acres) and Rational Drainage Data (if appropriate).
 - d. Directional Arrows depicting the general slope of the Drainage Area.
 - e. Vicinity and Receiving Waters identified/named

B. DELIVERABLES:

NOTE: All files are to be in digital format and submitted electronically or other pre-approved methods, pre-approval only given by an Area Manager or Survey Division Administration. **Compact Disks are no longer acceptable for submittals.**

1. The OpenRoads Designer® files as outlined above
2. Coordinate Geometry List in ASCII format
3. Monument Record spreadsheet, utilizing SD Excel file

The Following Files in PDF format

4. Historical Letter and Written Report
5. SD Form No. 7 Public & Privately Owned Utilities List
6. Oklahoma Certified Corner Record Forms in PDF format (see Examples/Consultant Pack)
7. SD Form No. 11 Survey Control Monument Record in PDF format (see Examples/Consultant Pack)

8. SD Form No. 41 Surveyor Certification, signed and sealed
9. Bench Mark List, including stationing and offsets
10. Alignment and Coordinate Geometry List, including bench marks
11. Ownerships List
12. Network/OPUS adjustment reports, if applicable.
13. GPS on Bench Marks submittal to and acceptance from NGS
14. OSSDA Field Form
15. Subsurface Utility Engineer report, if applicable
16. RTN Monument Check.xlsx, or equivalent form, if applicable