

**SECTION 02 21 13
SITE SURVEYS**

SPEC WRITER NOTE:

1. Delete text between // _____ // not applicable to project. Edit remaining text to suit project.
2. Use this section to specify survey required before design begins and for recording property survey with local authority having jurisdiction.
3. See Section 01 00 00, GENERAL REQUIREMENTS for work-layout surveys performed for construction.

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Researching and collecting documents informing surveys.
 2. Performing // boundary survey, // topographic survey, // and // utility survey //.
 3. Creating survey drawings.

1.2 APPLICABLE PUBLICATIONS

- A. Comply with references to extent specified in this section.
- B. American Land Title Association and American Congress on Surveying and Mapping (ALTA-ACSM):
1. Accuracy Standards for ALTA-ACSM Land Title Surveys.
- C. Federal Geographic Data Committee (FGDC):
1. STD-007.03-98 - Geospatial Positioning Accuracy Standards Part 3: National Standard for Spatial Data Accuracy.
 2. STD-007.04-02 - Geospatial Positioning Accuracy Standards Part 4: Standards for Architecture, Engineering, Construction (A/E/C) and Facility Management.

1.3 SUBMITTALS

- A. Survey Drawings, as described in section 3.4.

1.4 QUALITY ASSURANCE

- A. Land Surveyor: One of the following:
1. Professional Land Surveyor: One who possesses a valid state license as a "Professional Land Surveyor" from the state in which they practice, and where the project is located.
 2. Professional Civil Engineer: One who possesses a valid state license as a "Professional Civil Engineer" from the state in which they practice, and where the project is located. For this section, the

term "land surveyor" shall also include Professional Civil Engineers authorized to practice Land Surveying under the laws of the state in which they practice.

PART 2 - PRODUCTS

2.1 ACCESSORIES

- A. Monuments: Iron pin, with driven 16 mm (5/8 inch) diameter, minimum 600 mm (24 inches) long to prevent displacement.
- B. Stakes: Hardwood.
- C. Flagging: Plastic, roll form, highly visible, solid color.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Research public and VA facility records for deeds, maps, monuments, plats, surveys, title certificates or abstracts, rights-of-way, easements, section line, other boundary line locations, and other documents pertaining to project site.
- B. Research public and VA facility utility records for aerial, surface, and subgrade structures and utility service lines and easements.

3.2 PREPARATION

- A. Coordinate with Contracting Officer's Representative for site access.
- B. Coordinate with adjacent property owners when access to adjoining properties is required.
 - 1. Notify Contracting Officer's Representative when access is denied.

3.3 SURVEYS

SPEC WRITER NOTE: Retain ALTA-ACSM standard for property surveys recorded with local authority having jurisdiction. Always retain FGDC standards for Federal Government facilities.

- A. Perform survey on ground according to the latest version of// "Minimum Standard Detail Requirements for ALTA/NSPS Land Title Surveys" // and // FGDC STD-007.3 and FGDC STD-007.4 //.

SPEC WRITER NOTE: Retain required survey types and edit survey drawing requirements to match.

- B. Boundary Survey:
 - 1. Locate permanent monuments within and along survey boundary.

2. Set permanent monuments at property corners when monument is not found.
3. Temporarily mark monument locations with stake and flagging.
4. Reconcile differences between legal description and survey.

C. Topographic Survey:

1. Vertical Control: National Geodetic Survey (NGS) or existing VA Facility benchmark. Identify location, description, and datum.

SPEC WRITER NOTE: Retain first option for small sites and second option for large sites.

2. Install minimum one permanent NGS benchmark // plus one permanent benchmark for each 1.6 hectares (4 acres) within survey boundary //, for use by any future surveyors for projects on the property.
3. Furnish and install two monuments on the property, or property lines, that are tied to the State Plane Coordinate system, and indicate the respective Northing and Easting coordinates for the points in feet, with 3 decimal place accuracy.

SPEC WRITER NOTE: Adjust contour interval to suit project conditions.

4. Determine project site contours at maximum // 300 mm (1 foot) // interval.
5. Determine spot elevations at specified locations.
6. Accuracy: The survey shall have an absolute horizontal accuracy of +/- 0.1 feet relative to the project coordinate system. The survey shall have an absolute vertical accuracy of +/- 0.1 feet relative to the project benchmarks. The survey shall have a relative vertical accuracy of +/- 0.05 feet between any two points within 100 feet of each other.
7. When authorized, by the COR, to perform aerial mapping (using manned
8. aircraft), the topographic survey shall conform to the following accuracy requirements: The survey shall have an absolute horizontal accuracy of +/- 0.3 feet relative to the project coordinate system. The survey shall have a relative horizontal accuracy of +/- 0.1 feet between any two points within 100 feet of each other. The survey shall have an absolute vertical accuracy of +/- 0.5 feet relative to the project benchmarks. The survey shall have a relative vertical

accuracy of +/- 0.1 feet between any two points within 100 feet of each other.

D. Utility Survey:

1. Locate piped utilities and utility structures. Identify service type, material, sizes, depths, and pressures. Establish inverts in and out on gravity sewer manholes. If depth is critical and manholes are not available identify depth with ground-penetrating radar (GPR).
2. Locate fire hydrants.
3. Locate wired utilities and utility structures. Identify service type, rated capacities, and elevations above and below grade.
4. Identify each utility authority including contact person and phone number.

E. Locate permanent structures within survey boundary by perpendicular dimension to property lines.

1. Determine structure plan dimensions, heights, and vertical offsets.
2. Determine projections and overhangs beyond structure footprint at grade.
3. Determine number of stories and primary building materials.

F. Locate rights-of-way, easements and encumbrances within and adjacent to survey boundary by perpendicular dimension to property line(s).

1. Locate project site access from rights-of-way by dimension from survey monument. Determine site access width.

3.4 SURVEY DRAWING REQUIREMENTS

A. Consult Contracting Officer's Representative to confirm required survey scale and drawing size.

1. Drawing Size to plot: Maximum 760 by 1070 mm (30 by 42 inches).
2. If the plat or map of survey consists of more than one sheet, the sheets shall be numbered, the total number of sheets indicated and the match lines be shown on each sheet.
3. Boundary Survey Scale: Maximum 1 to 35 (1 inch equals 30 feet).
4. Enlarged Detail Areas: Scale as required to present dimensional data and survey information clearly. Maintain orientation aligned with smaller scale view.
5. Plan Orientation: North at top of drawing sheet.
6. Unless specifically noted otherwise, develop electronic drawings files of the survey in accordance with the VA BIM Standard as required by PG-18-15 (<https://www.cfm.va.gov/til/aeDesSubReq.asp>)

and VA's BIM Manual (<https://www.cfm.va.gov/til/projReq.asp>) (refer to section 2.3 BIM Technology and Platforms for CAD/BIM software). Verify software version with VA Project Manager / VA CAD/BIM Standards Manager.

7. Electronic files must be in accordance with the VA BIM Standard as required by PG-18-15 (<https://www.cfm.va.gov/til/aeDesSubReq.asp>) and VA's BIM Manual (<https://www.cfm.va.gov/til/projReq.asp>).
8. Provide a 3D digital terrain model (DTM) represented as a single Civil 3D surface.
9. Electronic drawings files must be submitted in their native authoring software (AUTOCAD .dwg, AutoCAD Civil 3D, REVIT. rvt, etc. formats), and in PDF format.
10. Provide a photographic record (in hard and digital formats) of relevant or key features of the surveyed land.
11. Provide all field raw data files, field notes, field survey points, raw aerial mapping CAD files, LiDAR point clouds, photogrammetric drone image files, and all ground control data used for any remote (aerial, LiDAR, drone) mapping methods.
12. Remote Mapping: All data captured through LiDAR scanning, photogrammetric drone mapping, and when authorized, manned aerial mapping, is to be completely combined with all field survey data. Separate files containing data from different collection methods will not be accepted.

SPEC WRITER NOTE: Always retain drawing notations.

B. Drawing Notations:

1. Provide notes that the two installed monuments tied to the State Plane Coordinate system are the basis for the coordinate system indicated on the CADD survey drawings.
2. Land Surveyor: Name, address, telephone number, signature, seal, and registration number.
3. Survey Dates: Date survey was initially completed and subsequent revision dates.
4. Certification: Certify each drawing adjacent to land surveyor's seal:
5. "I hereby certify that all information indicated on this drawing was obtained or verified by actual measurements in the field and that

every effort has been made to provide complete and accurate information."

6. Title, number, and total number of drawings on each drawing.
 7. Scale in metric and imperial measurement.
 8. Graphic scale in metric and imperial measurement.
 9. Graphic symbol and abbreviation legends.
 10. North arrow for plan view drawings.
 11. Benchmark locations.
 12. Horizontal and vertical control datum.
 13. Adjacent property owner names.
 14. Zoning classifications.
 15. Building street numbers.
 16. Evidence of Possession: Indicate character and location of evidence of possession affecting project site. Notation absence signifies no observable evidence of possession.
- C. Vicinity Map: Indicate project site and nearby roadways and intersections.
- D. Record Documents Forming Survey Basis: Indicate titles, source, and recording data of documents relied upon to complete survey.
- E. Legal Description: Recorded title boundaries.

SPEC WRITER NOTE: Require land area in sq. m (sf) when site is less than 0.4 hectares (1 acre), otherwise, require hectares (acres).

- F. Land Area: Report in // sq. m (sf) // hectares (acres) // as defined by the boundaries of the legal description of the surveyed premises, including legal description of the land.
1. Accuracy: // 0.1 sq. m (1 sq. ft.) // 0.005 hectares (0.001 acres) //.
- G. Boundary Lines: Show point of beginning, length and bearing for straight lines, and angle, radius, point of curvature, point of tangency, and length of curved lines.
1. Include bearing basis and data necessary to mathematically close survey.
 2. When recorded and measured bearings, angles, and distances differ, indicate both recorded and measured data.
 - a. Indicate when recorded description does not mathematically close survey.

3. Indicate found and installed monuments establishing basis of survey.
 4. Contiguity, Gores, and Overlaps: Identify discrepancies within and along survey boundary.
- H. Lots and Parcels: Indicate entire lots and parcels included within and intersected by survey boundary.
- I. Roadways: Indicate names and widths of rights-of-way and roadways within and abutting survey boundary.
1. Indicate changes in rights-of-way lines either completed or proposed.
 2. Indicate accesses to roadways.
 3. Indicate abandoned roadways.
 4. Indicated unopened dedicated roadways.
- J. Setbacks: Indicate recorded setback and building restriction lines.
- K. Structures and Site Improvements: Indicate buildings, and other visible improvements such as walls, fences, signs, parking areas, plazas, planter beds, benches, swimming pools, etc.
1. Indicate each building dimensioned to property lines and other structures.
 2. Indicate exterior dimensions of buildings at ground level. Show area of exterior building footprint and gross floor area of entire building.
 3. Indicate the number of stories and maximum measured height of all buildings above grade at a defined location. If no defined location is provided, the point of measurement shall be shown.
 4. Indicate spot elevations at building entrances, first floor, service docks, corners, steps, ramps, and grade slabs.
 5. Indicate structures and site improvements within 1500 mm (5 feet) of survey boundary.
 6. Indicate encroachments on project site, adjoining property, easements, rights-of-way, and setback lines from fire escapes, bay windows, windows and doors opening out, flue pipes, stoops, eaves, cornices, areaways, stoops, other building projections, and site improvements.
 7. Identify and show setback, height, and floor space area restrictions set by applicable zoning and building codes, and recorded subdivision maps. Indicate if no restrictions exist.
- L. Easements:
1. Indicate easements evidenced by recorded documents.

- a. Indicate when easements cannot be located.
 2. Indicate observable easements created by roadways, rights-of-ways, water courses, drains, telephone, telegraph, electric and other wiring, water, sewer, oil, gas, and other pipelines within project site and on adjoining properties when potentially affecting project site.
 3. Indicate observable surface improvements of underground easements.
- M. Pavements // and Railroad Tracks //:
1. Indicate location, alignment, and dimensions for vehicular and pedestrian pavements // and railroad tracks //.
 2. Indicate pavement encroachments from adjacent properties onto project site and onto adjacent properties from project site.
 3. Dimension encroachments from survey boundary.
 4. Indicate roadway // and railroad tracks // centerlines with true bearings and lengths by 15 m (50 feet) stationing.
 - a. Describe curves by designating points of curvature and tangency. Include curve data and location of radius and vertex points.
 - b. Indicate elevations at station points along roadway centerlines, roadway edges, and top and bottom of curbs.
 - c. // Indicate elevations at station points along railway tracks. //
 5. Indicate parking areas, parking striping, and total parking spaces.
 - a. Identify accessible, // fuel efficient, // and // electric vehicle // parking spaces.
 6. Indicate curb cuts, driveways, and other accesses to public ways.
- N. Indicate cemetery and burial ground boundaries.
- O. Waterways:
1. Indicate boundaries of ponds, lakes, springs, and rivers bordering on or running through project site. Note date of measurement and that boundary is subject to change due to natural causes.
 2. Indicate flood plain location and elevation.
 3. Indicate watershed extent affecting project site.
- P. Flood Zone: Indicate applicable flood zone designation from Federal Flood Insurance Rate Maps or the state or local equivalent, by scaled map location and graphic plotting.
- Q. Public and Private Utilities:
1. Indicate information source and operating authority for each utility.

2. Indicate utilities existing on or serving project site.
3. Indicate fire hydrants on project site and within 150 m (500 feet) of survey boundary.
4. Indicate manholes, catch basins, inlets, vaults, and other surface indications of subgrade services.
5. Indicate depths or invert elevations, sizes, materials, and pressures of utility pipes.
6. Indicate wires and cables serving, crossing, and adjacent to project site.
7. Indicate exterior lighting, traffic control facilities, security, and communications systems.
8. Indicate utility poles on project site and within 3 m (10 feet) of survey boundary.
9. Indicate dimensions of cross-wires or overhangs affecting project site.

R. Observable Evidence:

1. Indicate in-progress and recently completed earth moving work, building construction, and building additions.
2. Indicate in-progress and recently completed pavement construction and repairs.
3. Indicate observable evidence of site areas used as solid waste dump, sump, and sanitary landfill.

S. Trees:

1. Indicate individual trees with minimum 150 mm (6 inches) diameter measured at 1200 mm (48 inches) above grade.
2. Indicate wooded area perimeter outline and description of predominant vegetation.

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