

CHAPTER 1

GENERAL

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Sec. 1.01 Legal Status of the Survey

The State Highway Commissioner is authorized by the [Code of Virginia §33.2-1011](#) to make surveys for highway purposes upon any land in the Commonwealth. Said code sets forth the procedure(s) to be followed to lawfully procure and establish the right to enter on land to ascertain its suitability for highway and other transportation purposes. See this VDOT Survey Manual, [Chapter 4](#) for further information on the Right of Entry process. VDOT personnel and VDOT authorized consultants can find more specific documentation and detailed instructions in VDOT ProjectWise at [pw:\\WAP04113.cov.virginia.gov:PW\Documents\Standards \(Forms, Job Aids, Installs, Training\)\Right of Entry\](#).

This authority should never be used arbitrarily but should be thoroughly tempered with proper respect for private property and for the rights and feelings of the individual.

Sec. 1.02 Authorization and Assignment of Surveys

Sec. 1.02.1 Authorization

All surveys for highways on all systems, including closed surveys for determination of ownership or for purchase, are to be authorized by the State Location and Design Engineer or their representative. This authorization will be in the form of a memorandum in which the scope of the project, length, type of survey required, and any other pertinent data will be outlined. Supplemental data, made available to assist in performing the survey, will also be furnished.

Supplemental survey data, or information, may include, but is not limited to: National Geodetic Survey (NGS) field survey control, both horizontal and vertical, U.S. Geological Survey topographic maps, photographs of the area, existing road plans, and prints of adjacent projects in the planning stage. As schedules permit, the Global Positioning System, as initiated by the District Survey Manager, shall be used to provide field survey control to the project based upon published government control.

National Geodetic Survey datasheets for the NGS control monuments can be acquired by visiting the NGS web site and using the searchable database for datasheet retrieval at <https://www.ngs.noaa.gov/datasheets/>. Current and historical U.S. Geological Survey topographic maps can be viewed or obtained by visiting the U.S.G.S. store at <https://store.usgs.gov/map-locator>. See [Section 1.10](#) of this chapter for more information regarding the process for requesting State Highway Plans.

After the location approval by the Commonwealth Transportation Board and the Federal Highway Administration, survey authorization for Interstates will be made in accordance with tentative construction schedules. Survey authorization for Principal or Minor Arterial System projects will be made in accordance with established construction or planning schedules. Prior approval must be given by the Federal Highway Administration on projects where Federal Aid for preliminary engineering is requested.

Survey authorization for the Secondary System (Arterial, Collector, Local Roads) will be made when requested by the Secondary Roads Division, in accordance with planning schedules and the Secondary System Contract Advertisement Schedule.

Please refer to [Figure 1-A](#) for current survey related codes and their descriptions.

The Department's policy is not to re-establish right of way lines for adjacent property owners or anyone else unless it is to serve the Department's needs. The Department will, however, assist others, such as property owners, engineers or surveyors in establishing right of way by providing plans and other available information. The surveying necessary to re-establish the lines is the responsibility of the one having the need for such information. The Commissioner of Highways may have maps or plats prepared at request and expense of local governing bodies and other groups in accordance with [Section §33.2-236](#) of the Code of Virginia.

Sec. 1.02.2 Survey Assignments

Upon receipt of a survey authorization, the Survey Manager will assign the project to a Survey Supervisor (Land Surveyor) in the district or Consultant staff. During the progress of the survey, the Survey Manager will review the work for conformance with current instructions and ascertain that the survey data is complete and covers the proposed project.

Sec. 1.02.3 Consultant Assignments

Survey Managers, the State Photogrammetry Supervisor, and the GeoSpatial Program Manager shall be informed by email of ANY photogrammetric, survey, UAS flight, or SUE work being performed by all primes and/or sub-consultants under any VDOT contract in each respective district prior to commencement of the survey. All photogrammetric, survey, UAS or SUE deliverables shall be submitted to the District and Central office as work is completed via ProjectWise regardless of the contract that it was performed under.

VDOT has Photogrammetry, Survey, UAS and SUE prime consultants available for obtaining services in the photogrammetric, LIDAR, UAS, surveying and subsurface utility engineering fields. These services are requested through task assignments. Each consultant is responsible for obtaining ProjectWise Access for each task assignment. The task assignment process is outlined below.

[Represents communication protocol to be used]

- Use the UPC first in the subject line of the email.

1. Assignments are initiated at the district or CO level by the Project Manager or other personnel and sent to the Survey Manager or GeoSpatial Program Manager (CO). **[LD forms and email]**
2. The Survey Manager will contact the GeoSpatial Program Manager with the project information so a prime can be assigned. Information includes: scope of work, UPC#, activity code, Agency One Use code, PM name and contact number, due date, and notice if any consultants have already been on the job. If aerial photography is necessary, the State Photogrammetry Supervisor will be contacted prior to assignment to a consultant. **[email]**

3. The GeoSpatial Program Manager will assign a prime to the task based on the information provided by the district that best fits the Departments business needs. Consultants that have prior involvement on the job will be reassigned to the job when practicable and available. **[email]** {Time to return:} <=1 business day in general.
4. The Survey Manager will contact the Prime assigned and request an estimate based upon the scope information. **[email]**
5. The Prime will complete an estimate based on the information provided. The following items should be included in the final estimate: {Time to return:} 5 days by contract.
 - a. Narrative letter – includes a detailed scope, VDOT charges codes for billing, VDOT responsibilities (if any), contract MOA date with term, schedule, and deliverables
 - b. Distribution of Man-hours in spreadsheet format
 - c. Fee Calculation work sheet – Limit to 1 page
 - d. Project limits provided by the Department –Sketches, maps, written documentation
 - e. Attachments – Should be used for sub-consultant’s services
 - f. Any additional documentation if relevant to the task
 - g. PDF Name should include: UPC-Route-Desc example: 4632-630-Location survey.pdf
6. Prime submits copy of estimate to the Survey Manager. The GeoSpatial Program Manager and the Survey Support Supervisors will be cc’d with all correspondence by using the email address of GeoSpatial-info@VDOT.virginia.gov. **[email]** Do not send color files unless Department requests.
7. Survey Manager is responsible for reviewing, negotiating hours, and obtaining the Project Managers notice to proceed (NTP) which includes invoicing UPC/Cost Center and activities. NTP will sent be to: NTP-Survey@vdot.virginia.gov and the Survey Support Supervisors. Project Managers will provide an open activity for the task assignment and must keep it open for the duration of the work. **[email]**
8. **GeoSpatial Program Manager is responsible for reviewing and giving final NTP to the Consultant.**
 - a. NTP will be given by email first. **[email]**
 - b. A formal letter will be provided by US mail service to the Consultant. **[letter]**
9. Consultant will track each districts task requests and provide reports to the Department as requested. Bi-weekly reports will be inclusive of assigned and unassigned tasks. Report shall include: District, UPC, Route, Project Number, Description, NTP Date, Due Date, Project Percent Complete, Notes in Excel format. **[email]**
10. If NTP is not received by the Consultant within 2 weeks of submittal, the Consultant will email CO (GeoSpatial-info@VDOT.virginia.gov) and the District requesting the status of the assignment. **[email]**

11. Survey Managers will review the work for conformance with task request to ensure it meets the requirements outlined in the Survey Manual. Survey Manager will notify the consultant and CC the GeoSpatial Program Manager that the task has been completed, reviewed, and submitted per [Sec. 1.08](#) so the task assignment can be closed. **[email]**

12. Survey Managers will fill out consultant evaluation forms.

Sec. 1.02.4 Consultant Assignments --- Structure Monitoring

VDOT has a prime consultant available for obtaining services in the field of monitoring deformation of structures. These services are requested through task assignments. Each consultant is responsible for obtaining ProjectWise Access for each task assignment. The task assignment process is outlined below.

[Represents communication protocol to be used]

- Use the UPC first in the subject line of the email.

1. Assignments are initiated at the district or CO level by the Project Manager or other personnel and sent to the Survey Support Supervisor and GeoSpatial Program Manager (CO) by using the email address of GeoSpatial-info@VDOT.virginia.gov. **[LD forms and email]**
2. The Project Manager will contact the Survey Support Supervisor and GeoSpatial Program Manager with the project information so a prime can be assigned. Information includes: scope of work, UPC#, activity code, Agency One Use code, PM name and contact number, due date, and notice if any consultants have already been on the job. **[email]**
3. The Survey Support Supervisor, in consult with the GeoSpatial Program Manager, will assign a prime to the task based on the information provided by the district that best fits the Departments business needs. Consultants that have prior involvement on the job will be reassigned to the job when practicable and available. **[email]**
4. The Survey Support Supervisor will contact the Prime for an estimate based on the scope information. **[email]**
5. The Prime will complete an estimate based on the information provided. The following items should be included in the final estimate: {Time to return:} 5 days by contract
 - a. Narrative letter – includes a detailed scope, VDOT charge codes, VDOT responsibilities (if any), contract MOA date with term, schedule, and deliverables
 - b. Distribution of Man-hours in spreadsheet format
 - c. Fee Calculation work sheet – Limit to 1 page
 - d. Project limits provided by the Department –Sketches, maps, written documentation
 - e. Attachments – Should be used for sub-consultant’s services
 - f. Any additional documentation if relevant to the task
 - g. PDF Name should include: UPC-Route-Desc example: 4632-630-Deformation survey.pdf

6. Prime submits copy of estimate to the Survey Support Supervisor. The GeoSpatial Program Manager will be cc'd with all correspondence by using the email address of GeoSpatial-info@VDOT.virginia.gov. **[email]** Do not send color files unless Department requests.
7. Survey Support Supervisor is responsible for reviewing, negotiating hours and obtaining the Project Managers notice to proceed (NTP) which includes invoicing UPC/Cost Center and activities. NTP will sent be to: NTP-Survey@vdot.virginia.gov . Project Managers will provide an open activity for the task assignment and must keep it open for the duration of the work. **[email]**
8. **GeoSpatial Program Manager is responsible for reviewing and giving the final NTP to the Consultant.**
 - a. NTP will be given by email first. **[email]**
 - b. A formal letter will be provided by US mail service to the Consultant. **[letter]**
9. Consultant will track each task request and provide reports to the Department as requested. Bi-weekly reports will be inclusive of assigned and unassigned tasks and shall include: District, UPC, Route, Project Number, Description, NTP Date, Due Date, Project Percent Complete, Notes in Excel format. **[email]**
10. If NTP is not received by the Consultant within 2 weeks of submittal, the Consultant will email CO (GeoSpatial-info@VDOT.virginia.gov) and the District requesting the status of the assignment. **[email]**
11. Project/Task Manager will review the work for conformance with task request to ensure it meets the requirements outlined in the Survey Manual. The Survey Support Supervisor will notify the consultant and CC the GeoSpatial Program Manager that the task has been completed, reviewed, and submitted per [Sec. 1.08](#) so the task assignment can be closed. **[email]**
12. Task Managers will fill out consultant evaluation forms when requested.

Sec. 1.02.5 Consultant Invoices / Vouchers

All district invoices shall be reviewed by the Survey Managers and/or with the Project Managers within 5 days of receipt by email or mail. If Central Office does not receive notification from the District of an invoice discrepancy or charge code correction within five (5) business days of the email, Central Office will process the invoice, as submitted, under the UPC/Activity code on file. Identification of invoice discrepancy or charge code correction after the five (5) business days will be the responsibility of the District to correct. Please make sure all UPC/CSC's are open to charges for at least 60 days to allow the processing and payment of invoice.

Sec. 1.03 Working Hours

VDOT survey personnel working hours are set by the Department. These working hours may vary and be dependent upon extenuating circumstances in certain areas of the state. An example might be that survey personnel may be forbidden to work within the interstate right of way during rush hour traffic according to District policy for safety considerations.

The Land Surveyor Supervisor shall notify the Survey Manager by email or phone where they and the survey party will be working each day.

Sec. 1.04 Daily Diary / Field Notes

A complete diary, also known as Field Notes, shall be kept by the Survey Supervisor (Land Surveyor), should indicate the activities of all members of the party and the type and amount of work accomplished by the party. The diary will be checked frequently by the Survey Manager to ensure completeness and accuracy. See [Figure 1-B](#)

Sec. 1.05 Refuse Disposal

It is the responsibility of the person in charge of the party to see that the grounds are cleaned up after water breaks or lunch and all refuse is disposed of properly, whether on private property or within the State's right of way. Under no circumstances shall the survey personnel leave waste paper or any miscellaneous debris on any job site.

Sec. 1.06 Specifications and Standards

Each party will be furnished digital links to the [Road and Bridge Specifications](#), [Road Design Manual](#), [Road and Bridge Standards](#), [Construction Manual](#), and [Post-Construction Manual](#), and revisions or errata for same as they are issued. District Survey Managers, Survey Supervisor (Land Surveyor) and every member of the party must become familiar with the contents. Of particular importance should be the specifications and standards covering the type of road for which the survey is being performed. Other standard plans, such as minor drainage structures and revisions thereto, will be issued from time to time as deemed necessary.

Sec. 1.07 Accuracy of Surveys

All Survey topographic information must comply with the [Model Virginia Map Accuracy Standards and the National Map Accuracy Standards](#) for the scale of mapping. These standards are hyperlinked for ease of access and review. Control and Right of Way surveying is to comply with all applicable requirements of the latest edition of the Virginia Board for Architects, Professional Engineers, Land Surveyors, Certified Interior Designers and Landscape Architects regulations which can be accessed by visiting <http://www.dpor.virginia.gov/Boards/APELS/>.

Sec. 1.08 Submission of Completed Surveys

ProjectWise shall be used for all survey documentation, records, and DGN file storage. Once created all files shall be stored in the ProjectWise environment for the life of the project. Hyperlinks to the information shall be included in all of the project correspondence. Survey Folders have been created for storage and organizational purposes.

All GPS control “subject data” for VDOT surveys (either primary control or photogrammetric control) shall be delivered to VDOT’s Survey Support Supervisors for a quality control check and evaluation by using the email address of GeoSpatial-info@VDOT.virginia.gov. This information will be delivered to the Survey Support Supervisors immediately after completion of the primary control (deliverables are in [Section 5.06](#) of this Survey Manual).

After all field work has been completed as outlined in [Chapter 7](#) and the processing and final quality control checking have been completed, a copy of all survey, utility, DTM, contour, and all updated files are to be stored on the appropriate ProjectWise Document Management server.

The Survey Manager shall update activity 31S (Conduct Location Survey) in the IPM system for all projects surveyed by VDOT staff.

An e-mail transmittal shall be sent to the individuals listed below and CC’d to the email address GeoSpatial-info@VDOT.virginia.gov notifying them of the completion of the survey and the location of the files:

Projects designed in District or Central Office or by Consultants: Transmittal email to designer and project manager.

Bridge projects designed in District or Central Office or by Consultants: Transmittal email to the project manager, District or CO Bridge Engineer’s office.

For surveys in which all data has been secured except the utility designation, the survey shall not be shown as complete nor shall the element for the Human Resources Planning System be closed out until the utility designation is complete.

Sec. 1.09 Safety

All survey activities shall be governed by guidelines and instructions as issued by the State Traffic Engineer and the State Safety and Health Engineer. All survey personnel shall be very familiar with and aware of the guidelines as specified in VDOT’s “[Virginia Work Area Protection Manual](#)” and VDOT’s “[Work Zone Safety Guidelines for Temporary Traffic Control](#)”. All survey personnel, who will be in the roadway and are responsible for directing traffic in the work zone, shall have successfully completed and shall be certified as a flagman through VDOT’s Flagging Certification Program and CPR/First Aid training. All survey personnel who are required to enter confined spaces (i.e. manholes, utility vaults, etc.) shall be certified through VDOT’s Confined

Space Certification Program. Any questions or information requests regarding VDOT's Certification Programs should be directed to the State Safety and Health Engineer. All survey personnel are expected to wear the appropriate personal protective equipment (PPE) that the work location, work conditions or specific tasks may require

Sec. 1.10 Outside Requests for Survey Information

As time permits, the District or Central Office staff may provide approved roadway or right of way plans for land surveying professionals outside VDOT when requested by phone, mail, or email at their discretion. If the information is on an approved plan sheet(s), it will be satisfactory to sell them a print of the plan sheet. This will apply to horizontal control, vertical control and other survey information. If a person would like to come to the appropriate office and copy the data themselves, this would be satisfactory.

The VDOT Plan Library maintains the archive of Right of Way and Construction plans for State Highway Projects dating back to the early 1930s. Digital or print copies are available upon request. Please be advised that there is a charge for print copies. The preferred method for requesting Plans for State Highway Projects is by sending the [Plan Request Form LD-897](#) to David.Layne@VDOT.Virginia.gov. The Plan Library can also be contacted via telephone at 804-786-2521.

Sec. 1.11 The Location Survey Report

Unless specified otherwise by the GeoSpatial Program Manager, a Location Survey Report shall be submitted at the initial completion of all location survey projects performed internally or by consultant staff. The Location Survey Report shall be uploaded to the Project Documents Survey folder in ProjectWise and an email submitted with a hyperlink to the Survey Manager, the appropriate quality control person and cc'd to the GeoSpatial-info@VDOT.virginia.gov email address. The report shall accompany all necessary digital files that contain all requested survey data.

The Location Survey Report shall be in a separate WORD document (*.doc or *.docx) file format and shall consist of two parts, a heading (or informational block) and a body.

The heading shall contain the following:

- Route number, - 911 name - Project number - UPC #County/City
- District - Project Length - Work Begin/End Date
- Horizontal & Vertical Datum Basis - Survey Personnel Involved.

The body of the narrative will be a brief description of the project and shall include, but not be limited to, the following:

- the purpose of the assignment
- all traverse and level loop raw and adjusted closures
- a description of survey control and which points constrained the network
- utility owners and addresses
- possible locations of hazardous materials or contaminated soils
- conflicts with dissatisfied property owners
- general description of conflicts with record and field property data
- a list and description of each survey file and supporting data that is sent to the GeoSpatial Program Manager's office
- general observations or recommendations regarding the field survey and completed survey files

The Location Survey Report shall be archived with all project data for future reference and will be used and chronicled as an informational source for the life of the survey.

Sec. 1.12 Human Resources Planning System

The Human Resources Planning System was established in 1972 to enable the Department to determine personnel costs and manpower requirements related to the development of highway projects. This system records the hours expended for each element and provides a record for the project of the hours expended. From these records, "norms" are developed in order that manpower can be projected for new projects.

The Land Surveyor Supervisor shall become familiar with the system and properly educate their personnel regarding it. Time sheets should be reviewed carefully to ensure that the element code is correct for the type of work performed and that the element is closed out when that element is completed.

The Survey Manager shall have the responsibility of submitting budgets for projects and revising the budgets when necessary. [VDOT] Budgets compiled by the Survey Manager will be submitted to the Project Manager for inclusion into the "[Project Cost Estimating System](#)" (PCES) and the "Integrated Project Manager" (IPM) system. The [VDOT] activities listed in the current edition of the "[Project Tasks and Scheduling Guide](#)" should be used when making a budget for a project. Any project changes, such as alignment miles and/or any other changes made due to additional data or change in the scope of the project are input directly into the "Project Cost Estimating System" (PCES) and the "Integrated Project Management" (IPM) system after changes are approved [VDOT] by the Project Manager. The Survey Manager should review all changes before they are submitted to ensure the completeness and accuracy. Any questions regarding the work elements or project numbers, which are being charged to, should be directed to the Survey Manager.

Sec. 1.13 Advanced Survey Technologies: UAS, Laser Scanning and LiDAR

Sec. 1.13.1 Unmanned Aerial Systems (UAS)

UAS can be a very beneficial tool for surveying, design and construction, and as such, VDOT has developed Unmanned Aerial Systems (UAS) policies to guide authorized users in the safe operation of UAS in compliance with all local, state and federal regulations. Adherence to the policies, rules and regulations contained within the **VDOT UAS policies is mandatory for any UAS operations within VDOT right of way or at any other VDOT owned or operated properties.**

The VDOT UAS policy guidelines are meant to help protect all parties in the event of an unforeseen circumstance or incident during a UAS flight that may or may not involve the public. These UAS policies are a living document, as federal regulations and policies change so will the standards and procedures. UAS service providers & consultants should contact the UAS Section Manager with any questions or concerns about conducting UAS operation for VDOT.

Due to liability, for all parties, flight of drones without proper approval is not acceptable. Any non-VDOT administered flights are subject to VDOT Central Office approval prior to said flights taking place. Until such time that the FAA's Remote Identification System is fully implemented, all UAS flights will require written notification and/or approval from the UAS Section Manager before a UAS can be deployed on any VDOT project. The following operations will not be considered at this time:

- No flights over moving vehicular traffic will be authorized
- There will be no flights over people not participating in the operation
- No state-wide UAS flight requests will be authorized

Contractors and consultants shall submit a written UAS flight plan a minimum of five (5) business days in advance of any drone (UAS) flights to be conducted on or over VDOT controlled property. All UAS flight plans shall be submitted to the following email address: uasflightplan@vdot.virginia.gov.

Safety of the traveling public is paramount and all safety hazards must be identified and mitigated before approval of a UAS operation can be authorized. Regardless of a consultants approved FAA waivers, the UAS Section Manager will have the final approval on - VDOT projects.

Note 1: All UAS flights for VDOT are submitted to the Department of Aviation (DOAV) for UAS coordination and notification. The UAS pilot should not submit UAS requests to DOAV.

Note 2: The use of a UAS does not remove the right of entry, traffic safety or land use requirements from consultants or contractors on VDOT projects.

Sec. 1.13.2 Laser Scanning and LiDAR

Ground based Laser Scanning and Mobile LiDAR (Light Detection and Ranging) are covered in Chapter 9 of this survey manual. Laser Scanning and/or LiDAR systems are popular land surveying methods that can precisely measure and collect 3D coordinates from a variety of surfaces and objects. The terms Laser Scanning and LiDAR are quite often used interchangeably within the realm of land surveying. Chapter 9 provides guidelines to help ensure proper and efficient use of Laser Scanning and/or Light Detection and Ranging technology in support of VDOT projects. The subject laser scanning and LiDAR guidelines are not intended to be all encompassing or unnecessarily restrictive; nor are they intended to extend beyond the described laser scanning applications into more general survey use.

Airborne LiDAR used in support of and in conjunction with aerial photogrammetry is more fully described in Chapter 6 of this survey manual. Obtaining A-LiDAR data is standard practice on practically all aerial photogrammetry projects but will not be obtained as a standalone deliverable without aerial photography on VDOT projects without express written approval granting an exception.

Figure 1-A

Program/Project Management System (IPM) Activity Codes

22	SCOPE PROJECT
22S	PHOTOGRAMMETRY / AERIAL PHOTO / IMAGE PROCESSING
28	CONSULTANT PROCUREMENT
31S	CONDUCT LOCATION SURVEY
37S	MAJOR STRUCTURES / BRIDGE SURVEY
50	SURVEY / SUE DATA VERIFICATION
56S	SURVEY COMPENSATORY MITIGATION SITE
57S	RIGHT OF WAY SURVEY & STAKEOUT
58	SURVEY RIGHT OF WAY PLAN SHEETS
70S	UTILITY STAKEOUT – SURVEY
77A	MONITORING CONSULTANT CONSTRUCTION SURVEY
77S	CONSTRUCTION SURVEY
88	SURVEY MONUMENTATION

Figure 1-B

Surveying Daily Diary or Field Notes

The surveyor's field notes are the permanent written records of the survey taken at the time the work was done in the field. Keep in mind that others may be required to read the field notes and, therefore, care should be taken to ensure that the notes are clear and in a form others can readily interpret.

Proper Field Notes should include:

- Only one book should be used per project unless it has been filled. All project field information shall be placed in this book.
- First few pages of the book will initially remain blank for use as an index
- Update index as work is completed and subsequent pages are used
- A double sheet is considered one sheet
- Place the number of each page in the extreme upper right-hand side of the page
- Type of survey
- Record the name and assignment of each member of the surveying party.
- List of equipment used.
- The date and weather conditions should be recorded at the top right-hand side.
- The note taker should use a 3H or 4H pencil. 2H or ink will smear.
- If an error is made when recording measured or observed data, line through the error. Write in the correct data above the error. Do not erase.
- Data should reflect the degree of accuracy (7.40 is NOT written as 7.4). The decimal point or trailing zeroes should NOT be omitted.
- If you need to void a page, this is NOT done by tearing it out. The word VOID is written diagonally across the page (or 1/2 page).
- Explanatory notes about a particular reading should be written on the same horizontal line as the reading.
- If calculations on paper are necessary, these should be contained to the back pages of the field book.