

SECTION 11 83 02
GEODATA

PART 1 - GENERAL

1.1 DESCRIPTION

- A. The contractor shall collect and provide in GIS format all features described herein (referred to as "Geodata"), with survey-grade level accuracy, the real-world coordinate locations and elevations for the work to be performed as part of this project. The provided geodata shall allow for the use of said data in locating and verifying of features with the equipment provided in Section 11 83 00 GNSS.
- B. The contractor shall collect all geodata for the features indicated in Part 2 for the new work being performed as part of this project. The net result shall be a complete dataset of geodata for all applicable features listed in Part 2, being installed as part of the project. This includes points of connection, for applicable features, to existing features outside of the project area.
- C. The data collection requirements to record and document the geodata shall be as described herein with the features being displayed as points, polylines or closed polygons with the applicable symbology, line types, layers and colors in accordance with VA Geospatial Data Standards referenced below.

PART 2 - MATERIALS

2.1 GENERAL

- A. For this specification section, the production of electronic information, provided as an ArcGIS File Geodatabase, will be referenced as materials.
 - 1. GIS information from the contractor work areas for the project. The representation of the work constructed by the contractor as part of the project, is collected according to standards established herein, where the contractor shall produce detailed description and representation of the system for data collection, documentation and transfer to GIS format.
 - 2. The various elements within the work area to be collected shall be represented using VA Geospatial Data Standards. The contractor shall coordinate the field collected data for assimilation and configuration into GIS format.

2.2 DESCRIPTION OF DATA COLLECTION BY ELEMENT TYPE

A. The data collection for the new project work areas shall be consistent for the same types of entities in each location. The following paragraphs describe the site elements and the way they should be indicated in the GIS mapping, as well as indicating the information that should be included in the geodata for the respective elements being represented.

1. GIS data for the contractor constructed areas in the project area. All facilities constructed in the project area shall be documented to the level of accuracy required in Section 11 83 00. A geodatabase template for all required features and associated data will be provided by VA to be used by the contractor. Unless otherwise noted, all unique IDs needing to be generated must use the three-digit cemetery ID (AKA station number), followed by a hyphen, as a prefix for the ID (e.g. XXX-).

a. Points

- 1) Burial/Gravesite Grid Monuments- The features within the burial areas established to allow the staff to find their location within each burial section using taped measurements offset from reference lines between these monuments. A unique ID will be generated using the cemetery ID, burial section, "GGM" designation, and a sequential number starting at 1 for the monument closest to the street and left side of the section as viewed from the closest street (e.g. CEMETERYID-SECTION-GGM-X).
- 2) Burial/Burial Section Markers - Permanent above ground markers with the identification of the burial section number (typically two per burial section). A unique ID will be generated using the cemetery ID, burial section, "BSM" designation, and a sequential number starting at one (1) for the monument closest to the street and left side of the section as viewed from the closest street (e.g. CEMETERYID-SECTION-BSM-X). A digital photograph of the section marker shall be taken and attached as part of the data for the feature.
- 3) Environmental/Trees and Shrubs - All trees six-inch (6") caliper or smaller, and shrubs two-foot (2') diameter and smaller, within the project area. Data is to include

genus/species and common names. For larger trees and shrubs see the requirements for closed polygons.

- 4) SiteFeatures/Signs - All signposts, pads, and panel assemblies shall be collected as a point feature. For pads and panel assemblies, the point is to be the center of the feature. Data is to include signage type, installation date, material, sign text, and reverse side text. Unique identification shall be provided. Each sign shall be digitally photographed at the completion of its installation and the image shall be attached as part of the data for the point. A unique ID will be generated using the cemetery ID, "SIGN" designation, and a sequential number starting at 1 (e.g. CEMETERYID-SIGN-X).
- 5) Irrigation/Irrigation Structures - the actual locations for the installed sprinkler heads, valves, controls, fittings, quick couplers, flower watering spigots, and all other irrigation system components shall be collected. Information on the type, manufacturer, model, size, and material shall be included as installed. A unique ID will be generated using the cemetery ID, "IRR" designation, and a sequential number starting at 1 (e.g. CEMETERYID-IRR-X).
- 6) SiteFeatures/Flags Sleeves (A.K.A. Avenue of Flag Sleeves) - The installed sleeves for displaying flag for special days and events, located along the roadways throughout the cemetery. Unique identification shall be provided using the "FS" designation along with the cemetery ID (e.g. CEMETERYID-FS-X).
- 7) Utilities/Utility markers - The above ground markers indicating the location of a utility line, easement, or no dig areas around the underground utility lines. This is to include markers indicating locations of gas, water, sewer, telecommunication, and electric utilities.
- 8) SiteFeatures/Survey Monuments - Monuments, pins, or other markers set by surveyor to identify the cemetery boundary property line. Information about each point shall include type, designation and monument ID (if applicable), installation date, survey date, installation contractor name, northing, easting, and elevation in the local state plane coordinate system. Unique identification shall be provided

using the "SM" designation along with the cemetery ID (e.g. CEMETERYID-SM-X).

- 9) Administrative/Site - The point location of the main cemetery entrance within the cemetery boundary to be used as the geocode address point. The cemetery entrance point will hold all cemetery information including cemetery ID, cemetery name, mailing and physical addresses, phone numbers, and other administrative information.
- 10) Utilities/Water Utility Structures - the actual locations for the installed water hydrants, fire hydrants, valves, fittings, wells, and all other water system components shall be collected. Information on the type, make, model, size, and material shall be included as installed when applicable. A unique ID will be generated using the cemetery ID, "WATER" designation, and a sequential number starting at 1 (e.g. CEMETERYID-WATER-X). A digital photograph of spigots shall be taken and attached to the data file that show the completed installation as well as the configuration of the piping with the materials identified prior to installation, so the operations staff can order replacements as needed in the future.
- 11) Utilities/Sanitary Sewer Structures - the actual locations for the installed sanitary sewer or septic system manholes, cleanouts, pumps, and other sanitary sewer components shall be collected. Information on the type, make, model, size, elevations, and material shall be included as installed when applicable. A unique ID will be generated using the cemetery ID, "SAN" designation, and a sequential number starting at 1 (e.g. CEMETERYID-SAN-X). A digital photograph of the interior of all manhole structures shall be taken and attached to the data file, with the outlet always at the bottom of the picture.
- 12) Utilities/ Storm Sewer Structures - the actual locations for all installed storm sewer junction boxes, catch basins, outlets, weir boxes, and other storm sewer components shall be collected. A digital photograph of headwalls, in addition to the interior of all junction boxes, inlets, and catch basins, shall be taken and attached to the data file, with the outlet

- always at the bottom of the picture. Information on the type, make, model, size, elevations, and material shall be included as installed when applicable. A unique ID will be generated using the cemetery ID, "STORM" designation, and a sequential number starting at 1 (e.g., CEMETERYID-STORM-X).
- 13) Utilities/Electrical Structures - the actual locations for all installed electrical transformers, duct banks, boxes, and other electrical features shall be collected. Information on the type, make, model, size, elevation, and material shall be included as installed. A unique ID will be generated using the cemetery ID, "ELEC" designation, and a sequential number starting at 1 (e.g., CEMETERYID-ELEC-X).
 - 14) Utilities/Gas Structures - the actual locations for all installed gas fittings, valves, meters and other gas features shall be collected. Information on the type, make, model, size, elevation, and material shall be included as installed. A unique ID will be generated using the cemetery ID, "GAS" designation, and a sequential number starting at 1 (e.g., CEMETERYID-GAS-X).
 - 15) SiteFeatures/Flagpoles - Points representing the location of permanent flagpoles within the cemetery. The data associated shall indicate the type of flag flown, the size of the flag, the height of the pole, material of the pole, model, and the manufacturer for the pole. A unique ID will be generated using the cemetery ID, "FP" designation, and a sequential number starting at 1 (e.g., CEMETERYID-FP-X).
 - 16) SiteFeatures/Lighting - the locations for all exterior lighting to include lighting for landscaping, signage, pathways, and streets within the cemetery. Attributes for each point shall include the lighting type, installation date, and a unique ID will be generated using the cemetery ID, "LIGHT" designation, and a sequential number starting at 1 (e.g., CEMETERYID-LIGHT-X).
 - 17) SiteFeatures/Benches - A point representing the GNSS location of each bench installed. The data for benches shall include a geodatabase attachment digital photo of the bench. A sequential unique ID shall be created for each bench (e.g., CEMETERYID-BENCH-X).

- 18) SiteFeatures/Bollards - The GNSS location for each bollard and the elevation at the ground surface shall be provided. The data shall indicate the top elevation of the bollard, diameter, material, manufacturer, and color. A sequential unique ID shall be created for each bollard (e.g. CEMETERYID-BOLL-X).

b. Polylines

- 1) Utilities/Water Lines - Location of the waterlines, along the centerline on top of the pipe (maximum 50-foot intervals), with GNSS location and elevation shots at each change in direction or elevation, at all fittings, valves and any appurtenances. The data associated with the polyline should include the pipe material, size, and class of pipe. Each fitting, valve or appurtenance shall be identified in the data for the respective location and shall include the size, material, type of joint and class of the fitting, valve or appurtenance. A unique ID will be generated using the cemetery ID, "WATERLN" designation, and a sequential number starting at 1 (e.g. CEMETERYID-WATERLN-X). Lines are to be snapped to fittings.
- 2) Utilities/Sanitary Sewer Lines - Location of sanitary sewer gravity lines and sanitary sewer force mains shall be provided along the top centerline of the pipes when outside of structures. The data shall indicate the size, type and pressure class for the pipe installed, as well as the joint type. For the force mains, any changes in direction or elevation shall be location points for the installed pipe. Same information shall be provided for the data on the pipe. Provide upstream and downstream invert elevations at all junctions. A unique ID will be generated using the cemetery ID, "SANLN" designation, and a sequential number starting at 1 (e.g. CEMETERYID-SANLN-X). Lines are to be snapped to fittings.
- 3) Utilities/Storm Lines - Location of the storm drainpipe lines between structures, or between structures and daylight outlets, shall be located along the top of the pipe. Attributes shall include the installation date, size, material, and pressure rating for the pipe, and the joint

type. Provide upstream and downstream invert elevations at all junctions. A unique ID will be generated using the cemetery ID, "STORMLN" designation, and a sequential number starting at 1 (e.g. CEMETERYID-STORMLN-X). Lines are to be snapped to fittings.

- 4) Utilities/Electrical Lines - direct bury electrical lines, electrical lines in conduit, direct bury control wiring, control wiring in conduit, ground wires, phone lines, or any other buried wiring. Along with the location and depth for these lines, the data should identify the type, size, purpose, conduit size, whether the information is for the conduit, wire, or encasement of the conduit. Any overhead lines and poles that are in or through the contract work area for the project shall also be located and identified. A unique ID will be generated using the cemetery ID, "ELECLN" designation, and a sequential number starting at 1 (e.g. CEMETERYID-ELECLN-X). Lines are to be snapped to fittings.
- 5) Utilities/Gas Lines - Location of all gas lines in the project area. Centerlines should be used for location. Installation date, depth, material, and size for the lines should be identified. A unique ID will be generated using the cemetery ID, "GASLN" designation, and a sequential number starting at 1 (e.g. CEMETERYID-GASLN-X). Lines are to be snapped to all fittings.
- 6) SiteFeatures/Fencing - All permanent fencing in the project construction area with data regarding details for the fencing being included.
- 7) Environmental/Contour lines - The as constructed contour lines, major and minor, with elevation and creation date attributes at 1 foot contour intervals.
- 8) Environmental/Streams - All perennial, intermittent, and ephemeral streams, creeks, and rivers within, or touching, the cemetery boundary will be provided. Included in this will be the stream type and local name if available. A unique ID will be generated using the cemetery ID, "HYDROLN" designation, and a sequential number starting at 1 (e.g. CEMETERYID-HYDROLN-X).
- 9) SiteFeatures/Expansion Joints - Lines representing the joints between individual pavement and sidewalk features. The data

for the expansion joints shall indicate the materials used for the joint construction as well as the date of installation. A unique ID will be generated using the cemetery ID, "EXPANLN" designation, and a sequential number starting at 1 (e.g. CEMETERYID-EXPANLN-X).

- 10) Irrigation/Irrigation Lines - Cemetery layout of all irrigation lines with polylines snapped to and split at each irrigation structure and fitting. The data associated with the polyline should include the pipe material, size, depth, and class of pipe. A unique ID will be generated using the cemetery ID, "IRRLN" designation, and a sequential number starting at 1 (e.g., CEMETERYID-IRRLN-X).

c. Closed Polygons

- 1) SiteFeatures/Pavement- All roadways, sidewalks, paths, stairs, handicap access ramps, plazas, and curb areas within the project area shall be documented with the GNSS equipment. When pavement areas can be differentiated by time of installation, they should be individually included as separate closed polygons, with the appropriate date of placement indicated in the "InstallDate" field for the feature. The entire roadway pavement, parking areas, maintenance yard, shall be documented with closed polygons that adjoin to provide a complete area for the entire pavement, when selected. Curbs shall be differentiated by changes in the curb type, installation date, etc. and the appropriate information differentiating the various areas shall be included in the data associated with the closed polygons. Sidewalks shall be done like curbs, with the different types, material, installation dates, etc. being created as separate closed polygons. The closed polygons shall be created to adjoin each other, without breaks or overlaps so the selection of all will provide the cumulative square footage for the surface type. Individual closed polygons shall be created representing the distinct concrete elements of plazas surrounded by expansion joints or open sides to planter beds, lawn, etc. The closed polygons shall be created to differentiate differing materials used in the creation of the plaza. Data for the individual closed polygons shall indicate the installation date and the material for the specific closed

- polygons. A unique ID will be generated using the cemetery ID, "PAVEPOLY" designation, and a sequential number starting at 1 (e.g. CEMETERYID-PAVEPOLY-X).
- 2) Environmental/Turf Areas - The closed polygons for the lawn areas shall be created based upon the different types of lawn area (seeded, sod, different times for installation, differing mixes, etc.). A unique ID will be generated using the cemetery ID, "TURFPOLY" designation, and a sequential number starting at 1 (e.g. CEMETERYID-TURFPOLY-X). The closed polygons shall be created to adjoin each other, without breaks or overlaps so the selection of all will provide the cumulative square footage for the lawn area.
 - 3) Environmental/Landscape Beds - Closed polygons shall be created for each individual planter bed. Each Planter bed shall be assigned a unique identification designation using the cemetery ID, "BEDPOLY" designation, and a sequential number starting at 1 (e.g. CEMETERYID-BEDPOLY-X).
 - 4) Burial/Gravesites - Gravesite plots shall have individual closed polygons that have been created to the nominal size for the plot in the specific area. Example, the crypt field burial plots shall be created as standard size of (3' x 7'-8" or 3' x 8'-0") and the oversized crypt plots shall be created (4' x 10'). Each burial plot shall also be provided with a unique identification (CEMETERYID-SECTION-WALL-ROW-GRAVESITE) stored in the Gravesite ID field. Closed polygon features shall also be created for each in-ground cremains plot, columbarium wall niche, memorial plot, and memorial wall marker. Columbaria and memorial walls will be drawn birds-eye (i.e., from above), with real-world corner locations, and having each wall divided into equal sized polygons totaling the number of niches/plaques available for each wall. Text fields associated with burial plots shall be provided for the following: section, row, wall, gravesite number, and comment. Domain fields associated with burial plots shall be provided for the following: position source, gravesite type, gravesite size, gravesite status.
 - 5) Burial/Burial Sections - The burial sections should be represented as closed polygons delineating the area for each

section with the burial section attributed as the unique ID (e.g., CEMETERYID-SECTION).

- 6) SiteFeatures/Walls - The site walls are all non-burial walls located in the project area installed for decoration, privacy, landscape, boundary, etc. Site walls will be collected end-to-end with any breaks or change in the wall delineated. Any joints between wall segments shall be indicated as lines or polylines as separate elements, so they can be evaluated as to length for replacement (see expansion joints lines). The date of installation of the products as well as the identification (Manufacturer and model) and color of the product shall be included in the data for the element. A unique ID will be generated using the cemetery ID, "WALL" designation, and a sequential number starting at 1 (e.g. CEMETERYID-WALL-X). Site walls are to include for all wall types to be found at the site, including, seat walls, retaining walls, decorative walls and any other types not listed. The GNSS location information for the walls shall provide accurate position for the walls within the cemetery, and shall provide accurate location for the visible top of the walls. The elevation information shall be for the finished grade below the points indicated for the tops of the walls. Note: Columbaria and memorial walls are considered burial sections and gravesites and shall only be included there.
- 7) SiteFeatures/Buildings and Structures - Provide closed polygons representing the exterior wall lines for the buildings as they exist at the ground surface including any decking, exterior stairs, or platforms. For new and existing buildings, provide a set of exterior photos with views of each of the exterior walls that can be accessed as data for the closed polygon. Include the date of completion for work completed as part of the project, original construction date for existing buildings, building type, and a sequential unique ID for each building (e.g. CEMETERYID-BLDG-X).
- 8) SiteFeatures/Fuel Storage - The closed polygon shall indicate the footprint for the tank and fuel dispenser system. Data shall indicate the size, type, number and size/capacity of chambers, manufacturer, contact for servicing, as well as

photo(s) of the tank system. A unique ID shall be created for each tank (e.g. CEMETERYID-FUELPOLY-X).

- 9) SiteFeatures/Storage Bins - The footprint for material storage bins shall be delineated, with each bin being a separate closed polygon. Data shall identify the date of construction, and shall include digital photo(s) of the installation. A unique ID shall be created for each bin (e.g. CEMETERYID-BIN-X).
- 10) SiteFeatures/Easements - Closed polygons shall be created to delineate the location for any easements. Data shall indicate what the easement is for.
- 11) Administrative/Cemetery Boundary - Closed polygon(s) representing the legal property line(s) of the cemetery.
- 12) Utilities/Sanitary Sewer Areas - Closed polygon(s) representing larger sanitary sewer features such as septic leach field or septic tank. The outer perimeter of piping within a leach field or absorption bed shall be used as an overall closed polygon depicting the area of the system. Data will include photo(s) of the installation prior to backfill, with the laid-out laterals shown. Laterals and their attributes will be included in the Sanitary Lines feature class. Septic tank features shall indicate the footprint for the septic tank, capacity, and top and bottom elevations. Inlet and outlet elevations will be recorded with sanitary line features snapped the sanitary polygon. The data shall include digital photographs of the installation, prior to backfill showing the pipe routing, the access opening(s), and interior photos of the inlet and outlet pipe configuration. A unique ID will be generated using the cemetery ID, "SANPOLY" designation, and a sequential number starting at 1 (e.g., CEMETERYID-SANPOLY-X).
- 13) Utilities/Storm Areas - Closed polygon(s) representing storm sewer drainage areas such as retention or detention ponds. Data shall include capacity, top elevation, and bottom elevation. A unique ID will be generated using the cemetery ID, "STORMPOLY" designation, and a sequential number starting at 1 (e.g. CEMETERYID-STORMPOLY-X).

- 14) Environmental/Water Feature Areas - shall include closed polygons of natural and manmade lakes, ponds, and wetlands, except for storm water ponds, located in or touching the boundary of the property. A unique ID will be generated using the cemetery ID, "HYDROPOLY" designation, and a sequential number starting at 1 (e.g., CEMETERYID-HYDROPOLY-X).
- 15) Environmental/Tree Areas - Closed polygons representing wooded areas within the cemetery property boundary and solitary trees greater than six-inch (>6") caliper not within a wooded area. Data is to include diameter (in inches), genus/species, and common name for individual trees, in addition to providing a sequential unique ID (e.g. CEMETERYID-TREE-X). Except for the diameter and ID, the same is to be included for the dominant species of wooded areas.

2. AERIAL PHOTOGRAPHY

- A. The GIS configuration shall include georeferenced and orthorectified aerial imagery, with a pixel size no greater than four-inch, of the cemetery project area under this contract. The contractor shall demonstrate a sample of the imagery to VA for approval prior to purchasing. The imagery dataset shall include an image depicting the baseline cemetery conditions, prior to this project start. Upon completion of the project, the contractor shall have the entire project area flown as a second image, documenting post construction conditions. All imagery shall be flown with survey ground controls so images, within 1 centimeter accuracy, can be displayed as a base map with the geodata layers provided shown correctly on top.

PART 3 - EXECUTION

3.1 GENERAL

- A. The required geodata work shall result in a complete GIS dataset covering all areas within the scope of the project. The GIS elements that are created by the contractor as part of this work shall be submitted in an ESRI-based file geodatabase using VA provided schema. All applicable fields shall be populated within each feature class, with use of existing subtypes and domains when applicable.

- B. The various elements used to depict the site will be made up of points, polylines and closed polygons that shall be created using real-world survey locations of the features collected by the contractor.
- C. A/E shall provide CAD design files and the VA file geodatabase (FGDB) schema to the contractor at NTP. The contractor shall populate the FGDB with geodata as work progresses. Any early turn over area must have the geodata completed and transferred to VA whenever burial areas are transferred to the cemetery, so the cemetery may start collecting and tracking burial activities with the GNSS equipment per Section 11 83 00.
- D. The contractor shall provide the graphical representation of the location and elevation, as well as the data information for the geographically displayed information, for the elements in the provided FGDB format. The source for the graphical portion of the GIS shall be from the survey "As-Built" AutoCAD data supplemented, with attribute data from project details and field verification. The geographic coordinate and elevation information for the elements being added to the GIS database, whether points, polylines or closed polygons, shall be collected and represented in accordance with the accuracy requirement for the GNSS equipment (Section 11 83 00).

3.2 DEMONSTRATION

- A. Both specification sections included as part of the GNSS/GIS, Section 11 83 00 Global Navigation Satellite System (GNSS) and Section 11 83 02 GNSS & GIS Mapping and Geodata, require complete demonstration as part of the GNSS equipment and GIS data being furnished and made fully functional.
- B. The demonstration shall be sufficient to show all the GNSS/GIS facilities provided perform as approved during the submittal and review process for the project, and that the completed system, including all hardware, facilities, equipment, software, and appurtenances are completely operational and perform as specified.
- C. The GNSS/GIS facility demonstration shall be performed to the satisfaction of the RE and the A/E prior to proceeding with the training.

3.3 TRAINING

[SPEC WRITER OPTION] - Consult with NCA/CDIS to determine applicability and extent of training required for the cemetery.

- A. After construction is complete, with a fully operational GNSS system and approved geodata, the contractor shall notify the Resident Engineer of their readiness to coordinate training with NCA's CDIS on burial collection for the cemetery staff. Training must be complete before acceptance of geodata and GNSS system will be granted.
1. Provide two (2) four-hour training days, in coordination with NCA's CDIS team to ensure the latest guidance is provided, to cemetery staff on the system operation, field collection procedures, and maintenance.
 2. Training shall be completed on consecutive days at the time of inspection for equipment listed in 11 83 00 GNSS.

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