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Soil Conservation Service

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NATIONAL INSTRUCTION NO. 170-303, Second Edition

SUBJECT: CGI - TECHNICAL SPECIFICATIONS FOR DIGITIZING SOIL SURVEY MAPS

Purpose. To update the specifications and standards within the Soil Conservation Service (SCS) for developing a digital soil survey geographic data base.

Effective Date. This instruction is effective when received.

Background. This instruction was updated to include the Digital Line Graph (DLG) as an optional format for exchanging data. An appendix of definitions was also added. No changes were made to the digitizing specifications. Enclosed is the second edition of National Instruction No. 170-303 dated September 1990.

SCS is assigned lead federal responsibility to coordinate the management of the digital soil survey geographic data bases. As part of this responsibility, this instruction establishes the standards for collecting, storing, maintaining, and distributing the soil survey data. These standards address data collection, data accuracy, data format, and data exchange formats. Use of these standards will duplicate the mapping of the original soil survey and allow the data to be exchanged or shared by different geographic information systems.

Please refer to Part 605.1 of the National Soils Handbook which provides policy and procedures for the responsibility and management of the national soil geographic data bases.

Contact. For more information on these technical specifications, contact George Rohaley on FTS 447-5405 or commercial (202) 447-5405.

Directive Canceled. National Instruction No. 170-303, dated May 1988.

Filing Instructions. File in the National Instructions binder, Title 170.

ROBERT R. SHAW
Deputy Chief for Technology

Enclosure

DIST: N, T, S

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NATIONAL INSTRUCTION NO. 170-303

SUBJECT: CGI - TECHNICAL SPECIFICATIONS FOR DIGITIZING DETAILED SOIL MAPS

PART 303 - TECHNICAL SPECIFICATIONS FOR DIGITIZING DETAILED SOIL MAPS

303.0 Purpose.

This instruction establishes digitizing specifications and standards for the digital soil survey map component of the Soil Survey Geographic (SSURGO) data base. This instruction sets forth the policy and procedures for developing soil geographic data bases and digitizing soil maps as described in the National Soils Handbook, Part 605.11.

The use of these standards will:

- eliminate duplication and waste in developing soil databases,
- maintain the integrity and accuracy of the original soil survey,
- expand the use of soil survey information,
- facilitate the transfer of soil data between different
- geographic information systems.

303.1 Background.

The primary source of detailed soil data is the SCS published soil survey. The SCS and other federal and state agencies are turning to computer technology and Geographic Information Systems (GIS) to conduct resource planning, management, and decision making activities; increasing the demand for reliable and usable soil data in digital format. Soil data is a basic data layer used with other digital resource data layers being developed by SCS and other federal and state agencies.

The SSURGO database must meet an accuracy and format standard to be compatible and usable with other digital map layers. When map data is loaded into a computer, the computer requires a level of accuracy standardization for data to be registered between map data layers, overlayed, and analyzed. The use of a standard is of primary interest to both producers and users of spatially referenced data.

This standard supersedes the previous standard called the "Technical Specifications for Digitizing of Detailed Soil Survey Maps", dated May 1988.

303.2 Digitizing Defined.

(a) Digitizing. Digitizing is the process of converting information shown on analog maps into digital form for computer processing. There are three basic methods of digitizing; line-segment (also called arc-node and vector), scanning and grid cell.

(b) Line-segment. Line-segment digitizing uses a digitizer to measure the X and Y coordinates of mapped features and records their values. Names or labels for the map features are also entered to describe the digitized data. The line-segment method captures the actual map features (lines, points, and polygons in x, y coordinates) by tracing or recording these features with a cursor on a digitizing tablet. Digitizing requires digitizing software, a computer, peripheral computer equipment such as a digitizing table and tablet, graphics terminal, and a plotter for editing and hard copy output.

(c) Scanning. The process of using a scanning device to capture a raster copy of a map manuscript in a digital bit-map or binary format and recording it in a computer readable file.

(d) Grid-Cell. Grid-cell digitizing is done by choosing a grid-cell size, (usually in acres) establishing a grid control network, and encoding soil data into a computer for the dominant soil in each grid-cell or selecting the soil located at the center point of the grid-cell.

303.3 Digitizing methods.

(a) Line-Segment. The line-segment (vector) method of digitizing is the required method for developing the SSURGO database because it duplicates the original soil survey maps. The SCS-GRASS MAP/DEV digitizing subsystem is a line segment method, and is acceptable for developing the SSURGO database.

(b) Grid-Cell. The grid-cell (raster) digitizing method does not meet SSURGO data base standards since it cannot exactly duplicate the original soil survey maps. See the National Soils Handbook, Part 605.11 for information regarding the use of grid-cell digitizing.

(c) Raster Scanning. Use of raster digitizing software and or software that processes scanned digitizing is acceptable for soil survey digitizing as long as the software meets the specifications outlined in sections 303.5 thru 303.9. The SCS LTPlus raster digitizing and scanning process software meets these specifications.

(d) Rubber-sheeting. A technique called rubber-sheeting may be used as long as the final digital data meet SCS accuracy specifications and standards described in part 303.6. Rubbersheeting is the process of computer fitting soil map data digitized from photobase maps (either rectified or unrectified) to planimetrically accurate orthophoto maps or USGS topographic quadrangles.

303.4 Soil map materials required for digitizing.

The following materials and documents should be available at the time of digitizing.

(a) Soil legend. An itemized listing of all soil map symbols and names to be digitized.

(b) Soil maps. Soil maps showing all soil boundaries, soil map symbols, special soil features, and water boundaries serving as soil boundaries. These maps must be acceptable for digitizing as described in section 303.5.

(c) Map indexes. An index to soil maps and USGS topographic quadrangles or orthophotoquads.

(d) Published soil survey maps. Copies of the original published soil survey maps.

303.5 Base map requirements.

The soil survey base map must meet the following requirements:

(a) Map Accuracy. Soil surveys not mapped on a USGS 7 1/2 minute topoquad or orthophotoquad base maps must be recompiled onto either of these base maps before digitizing. These base maps meet the national map accuracy standards.

(b) Map sheet formats. Soil surveys mapped on the 1/2, 1/3, or 1/6 orthophotoquad formats can be digitized in these formats; however, digital soil data sets provided to the SCS must be merged and formatted in a full 7 1/2 minute quadrangle format.

303.6 Digitizing requirements.

(a) Features to be digitized. The following map features are to be digitized and named:

(1) Line Features:
- -Soil boundaries.
- -Map neatline.
- -Water boundaries (shoreline).
- -Limit of soil survey area boundary.
- -Special soil features (e.g. gullies).

(2) Point features:
- -Soil map symbols. (Abbreviated alpha-numeric or
- -numeric characters which describe the soil names
- -within the soil areas.)
- -Special soil features (e.g., wet spots).

(b) Soil boundaries. Digitize all soil boundaries within a .010" line width of the original soil boundary. Follow the centerline of the soil boundary. Represent each soil boundary with no greater number of coordinate pairs than is necessary to record the soil boundaries within the .010" accuracy limit.

All beginning and ending points of each digitized line will connect as at common intersecting point with another soil boundary, water boundary, limit of soil survey boundary, or the map neatline.

(c) Limit of soil survey and water boundaries. Limit of soil survey boundaries and water boundaries must meet the same .010" accuracy standard as soil boundaries.

(d) Map neatline. The map neatline also serves as a soil boundary and forms the maximum extent of the digital data set. Construct the map neatline as four separate straight line boundary segments. The beginning and ending point of each neatline will be identical to the four corner coordinate values of the 7 1/2-minute topoquad or orthophotoquad. These values must be explicitly entered, not digitized.

Soil boundaries intersecting the map neatline must have a common point of intersection with the map neatline. Soil boundaries intersecting map neatlines must not extend beyond or fall short of the map neatline.

(e) Soil map symbols. The soil map symbols will be identical to the soil map symbols shown on the original soil map. Position the soil map symbol within the soil area so the symbol begins within the soil area. Use the lower left corner of the first character of the soil symbol as the point of text origin.

Place additional soil map symbols within large or meandering soil areas to improve the readability of the map. If the survey is already published, placement of additional soil symbols should follow the placement shown on the original soil map.

Soil areas missing a soil map symbol should be labeled "XXX" until the symbol is determined. Areas outside the limit of soil survey boundary but within the neatline are to be named "Nodata." Water areas (ponds, lakes, etc.) are to be named "W."

(f) Special soil features. Special soil features may be either point features such as wet spots or linear features such as gullies. The coordinate point for special soil point feature shall be centrally located within the symbol. Digitize special linear soil features as a single line following the general path of the feature on the map. Establish the coordinate point origin for the label centrally located on the linear feature. The special soil feature (point or linear) should be named in accordance with the label corresponding to the feature in section 303.6(i).

(g) Edge matching. Check the adjoining map sheets prior to digitizing and revise, the location of soil boundaries if necessary, to assure lines and boundaries match. Consult the state soil scientist before any boundaries are adjusted.

The soil boundaries ending at all four neatlines of each map sheet should be computer joined to any adjoining map sheets to achieve an exact match. If this is not possible due to system limitations, match the soil boundaries to the adjoining maps within .010," centerline to centerline.

(h) Coordinate Values. If the SCS Geographic Exchange Format is used (See 303.7), store all coordinate values for the soil boundaries, as well as soil map symbols and special feature label locations in positive latitude and longitude decimal degree coordinate values, 3 digits to the left of the decimal, and a minimum of 5 digits to the right of the decimal.

It is not necessary to collect the coordinate values in decimal degree units during the digital recording process. Collect coordinate values in any coordinate system, provided the final digital data tape is recorded in latitude and longitude decimal degree values. All hard copy plots must duplicate the map projection of the original soil maps. Digitizing in table coordinates requires geographic positioning as well as a digital data transformation to a latitude and longitude ground coordinate system. Obtain information regarding ground coordinate and map projection transformations from the National Cartographic Center.

(i) Identification Codes and Labels. Use the following identification codes and special soil feature labels for the line, point, and feature data files described in the SCS Geographic Exchange format.

CATEGORY	TYPE	FILE	7-DIGIT ID CODE	DESCRIPTION	FEATURE LABELS
SCS	Point	*	9000003	Depression or sink	SNK
Combined	Point	*	9000111	Marsh or swamp	SWP
Soils	Point		9000130	Wet spot	WET
	Point		9000131	Clay spot	CLA
	Point		9000132	Gravelly spot	GRV
	Point		9000133	Gumbo, slick, scabby spot	SLK
	Point		9000134	Sandy spot	SAN
	Point		9000135	Stony or very stony spot	STN
	Line		9000230	Soil boundary	---
	Line		9000230	Water boundary	---
	Line		9000230	Map neatline	---
	Point	*	9000300	Spring	SPG
	Point		9000330	Soil map symbol	Abc
				Water	W
				Area beyond coverage	Nodata
				(map symbol unidentifiable)	XXX
	Point		9000331	Soil sample site	SOI
	Point		9000332	Well, artesian	WLA
	Point		9000333	Well, irrigated	WLI
	Point	*	9000402	Gravel pi	GRV
	Point	*	9000410	Rock outcrop, sandstone and shale	ROC
	Point		9000430	Blowout	BLO
	Point		9000431	Dump or nonsoil	NON
	Point		9000432	Indian mound	IND
	Point		9000433	Mine or Quarry	QUA
	Point		9000434	Slide or slip	SLI
	Feature		9000435	Escarpment, bedrock	ESCB
	Feature		9000436	Escarpment, other	ESCO
	Feature		9000437	Slope, short or steep	SLP
	Feature		9000438	Gully	GUL
	Point		9000439	Ad Hoc or special purpose	ADHC
	Point		9000440	Unidentifiable spot symbol	UNKN
	Point	*	9000603	Prominent hill or peak	PK
	Point	*	9000608	Saline spot	SAL
	Point		9000630	Severely eroded spot	ERO

* USGS identified minor codes for Combined Hydrography.

303.7 SCS Geographic Exchange Format.

(a) General. The SCS Geographic Exchange Format (SCS-GEF) is one of the two formats acceptable for storing, maintaining and distributing the SSURGO database. The Digital Line Graph Optional Format may also be used and is described in section 303.8.

A soil map data set must correspond to one 7 1/2 minute USGS quadrangle map area. A file contains multiple records and is considered at end when an end-of-file mark is found. The data set will consist of four separate files produced in consecutive order as follows:

(1) Header file. The header file describes the contents of the data set for reference purposes. Each digital data set is identified within the header file, using the name of the 7 1/2 minute quadrangle map. The header file does not require the extraction of data from other files.

(2) Line file. Contains soil boundaries, water boundaries, limit of soil survey boundaries, and map neatlines.

(3) Point file. Contains locations for soil map symbols and special soil point feature labels.

(4) Feature file. Contains all special soil line features not serving as soil boundaries, such as escarpments and gullies.

(b) Header File. The first file of a data set is the header file. It contains descriptors pertaining to the contents of the digital data set and the latitude and longitude coordinate locations of the map corners.

NOTE: Left justification is used on all fields except where noted by an "*", which designates right justification.

Record 1:

Column	1-30	Data Set Name (7 1/2' quadrangle name).
Column	31-37	Scale of digitized data.
Column	39-45	Map projection name.
Column	46-72	State abbreviation followed by the soil survey name being digitized.

Record 2:

Column	1-30	Name of the organization that digitized the data.
Column	31-45	Date of digitizing.
Column	46-63	Type of data (i.e., SSURGO).
Column	64-72	Coordinate system used (i.e., Latitude/Longitude).

Record 3:

Column	1-2	"SW" (Southwest quadrangle corner)
Column	4-15	Longitude value* (decimal degrees)
Column	18-2	Latitude value* (decimal degrees)
Column	32-40	"LONGITUDE" (alpha-characters)
Column	43-51	Longitude value* (degrees/min/sec)
Column	54-61	"LATITUDE" (alpha-characters)
Column	64-72	Latitude value* (degrees/min/sec)

Record 4:

Column	1-2	"NW" (Northwest quadrangle corner)
Column	4-15	Longitude value* (decimal degrees)
Column	18-29	Latitude value* (decimal degrees)
Column	32-40	"LONGITUDE" (alpha-characters)
Column	43-51	Longitude value* (degrees/min/sec)
Column	54-61	"LATITUDE" (alpha-characters)
Column	64-72	Latitude value* (degrees/min/sec)

Record 5:

Column	1-2	"NE" (Northeast quadrangle corner)
Column	4-15	Longitude value* (decimal degrees)
Column	18-29	Latitude value* (decimal degrees)
Column	32-40	"LONGITUDE" (alpha-characters)
Column	43-51	Longitude value* (degrees/min/sec)
Column	54-61	"LATITUDE" (alpha-characters)
Column	64-72	Latitude value* (degrees/min/sec)

Record 6:

Column	1-2	"SE" (Southeast quadrangle corner)
Column	4-15	Longitude value* (decimal degrees)
Column	18-2	Latitude value* (decimal degrees)
Column	32-40	"LONGITUDE" (alpha-characters)
Column	43-51	Longitude value* (degrees/min/sec)
Column	54-61	"LATITUDE" (alpha-characters)
Column	64-72	Latitude value* (degrees/min/sec)

* Value is right justified

(c) Line File. The second file is the line file; it contains soil boundaries, water boundaries, limit of soil survey boundaries, and map neatlines. All coordinate values are in decimal degrees. Each soil boundary consists of a combination of 40 fixed character records, with no more than 2,000 characters per block. Unique numerical labels, which represent the polygons to the left and the right of the soil boundary must be included. These unique labels provide an assigned numerical identity (i.e., 1-n) for each digitized polygon. Respective unique labels are used to link the line-segment records together to form polygons. Map neatlines are at the edge of data coverage. A neatline can have only one identifying soil map symbol and one unique polygon numerical identity, the other area symbol and unique numerical identity will be blank (not filled in); dependent upon digitizing direction.

BOUNDARY SEGMENT 1

Record 1:

Column	1-7	SCS ID CODE for soil boundary (i.e., 9000230)
Column	8-16	Left soil area map symbol (alpha numeric with trailing blanks)
Column	17-25	Right soil area map symbol (alpha-numeric with trailing blanks)
Column	26-30	Unique label representing the polygon to the left of the boundary (integer, left justified)
Column	31-35	Unique label representing the polygon to the right of the boundary (integer, left justified)
Column	36-40	Number of coordinate records following (integer, right justified)

Record 2 thru N:

Column	1-16	Blank spaces
Column	17-28	Longitude value* (decimal degrees)
Column	29-40	Latitude value* (decimal degrees)

BOUNDARY SEGMENT 2 THRU N

Record 1:

Column	1-7	SCS ID CODE for soil boundary (i.e., 9000230)
Column	8-16	Left soil area map symbol (alpha-numeric with trailing blanks)
Column	17-25	Right soil area map symbol (alpha-numeric with trailing blanks)
Column	26-3	Unique label representing the polygon to the left of the boundary (integer, left justified)
Column	31-35	Unique label representing the polygon to the right of the boundary (integer, left justified.
Column	36-40	Number of coordinate records following (integer, right justified)

Record 2 thru N:

Column	1-16	Blank spaces
Column	17-28	Longitude value* (decimal degrees)
Column	29-40	Latitude value* (decimal degrees)

(d) Point File. The third file is the point file; it contains the location for soil map symbols and special soil point feature label records. All values are in decimal degrees. Each symbol is contained in a 40 character record, with no more than 2,000 characters per block. (Single coordinate points for soil map symbols, and special soil feature labels records are not system linked to the soil boundaries, but are used to define the placement of the appropriate soil map symbol for each polygon and special soil feature location.)

Record 1 thru N:

Column	1-7	SCS ID CODE for soil map symbols or special soil feature labels (e.g., 9000330 soil map symbols or 9000130 special soil feature label)
Column	8-16	Soil map symbols (alpha-numeric with trailing blanks)
Column	17-28	Longitude value* (decimal degrees)
Column	29-40	Latitude value* (decimal degrees)

(e) Feature File. The fourth file of a data set is the feature file. It contains special soil line features not serving as soil boundaries, such as escarpments and gullies. All values are in decimal degrees. Each feature is made of a combination of 40 character records, with no more than 2,000 characters per block.

LINE FEATURE 1

Record 1:

Column 1- 7	SCS ID CODE for line feature (e.g., 9000435 special soil feature label
Column 8-16	Line feature name (alpha-numeric with trailing blanks)
Column 36-40	Number of coordinate records following (integer, right justified)

Record 2 thru N:

Column 1-16	blank spaces
Column 17-28	Longitude value* (decimal degrees)
Column 29-40	Latitude value* (decimal degrees)

303.8 Modified Digital Line Graph Optional Format.

The Digital Line Graph Optional Format (DLG-3), may be used to exchange data as an alternative to SCS-GEF. DLG-3 Optional format is described in Appendix (B) in the U.S. Geological Survey National Mapping Program, Technical Instruction, Data Users Guide 1, entitled Digital Line Graphs from 1:24,000-Scale Maps. A sample DLG data file is available from the NCC.

Compliance to Sections 303.1 through 303.6, and Sections 303.8 through 303.10 is necessary when providing data in the DLG-3 Optional Format.

The DLG-3 Optional Format requires the digital data to be in ground Universal Transverse Mercator (UTM) coordinates. SCS requires that SSURGO data be provided as three separate files: a soil area file, a soil area attribute file, and a feature file. The soil area attribute file is an ASCII file containing alphanumeric labels of soil areas or polygons. Alphanumeric attributes are not supported by the DLG-3 format. The remaining two files are DLG-3 formatted files.

(a) Soil area file. The soil area or polygon file contains DLG header records and DLG data records. Required data records include:

- area identification records which contain a point location within each area that serves as a reference point for plotting soil area names,

- line identification records and coordinate string records containing all linework serving as soil boundaries, and

- area-to-line linkage records identifying which lines belong to which polygons.

Note that DLG attribute code records, node identification records, and node-to-line linkage records are not required. They can be present but will not be used.

(b) Soil area attribute file. This file, an ASCII file, contains one data record for each soil area or polygon. Each record consists of a left-justified area identification number followed by a space and then the soil area name. The area identification number must match the unique area number in the DLG soil area file area identification record. The soil area name matches the names shown on the map compilation source document.

(c) Soil feature file. The soil feature file contains special linear soil features (e.g. escarpments) and/or spot symbols (e.g. wells). The soil feature file contains DLG header records and DLG data records. Required data records for point and/or linear features include: line identification records, coordinate string records, and attribute records. Point features are recorded as degenerate lines.

Note that DLG node identification records and node-to-line linkage records are not required. They can be present but will not be used.

Attribute codes use the 7-digit ID codes identified in section 303.6-(i). The first 3 digits are recorded as a DLG major code. The last 4 digits are recorded as a DLG minor code.

303.9 Magnetic tape requirements.

Magnetic tapes are to be prepared in accordance with the following format, structure, and standards:

(1) A magnetic tape may contain multiple data sets, consisting of up to four files each. If more than one data set is placed on a single tape, each data set must be complete and contain all of its files.

(2) All map data sets will be placed on 9-track magnetic tape with the following specifications:

- Density of 1600/6250 BPI.
- Unlabeled ASCII coded.
- Odd parity, 9-track ANSI compatible tape
- Certified at 6250 BPI density.
- Each file terminates with a USA/ANSI standard end-of-file mark.

(3) Make two magnetic tapes of all data sets. The second tape serves as a back-up copy. Deliver one or both tapes to the National Cartographic Center for storage, tape maintenance, and distribution.

303.10 Quality control.

(a) Check plot requirements. A computer check plot is required for each digitized soil map data set at the same scale and map projection as the original soil map sheet in 7 1/2 minute format. If the original soil map is other than 1:24,000, an additional computer generated check plot map is to be made for each soil map at the 1:24,000 scale after the final digitized data is accepted. The check plots are to accurately represent the data on the magnetic tape data sets.

Complete a preliminary edit of the first two adjoining maps digitized and forward to the NCC for review. Materials needed to conduct the preliminary review include:

- The check plots.
- The digital data sets on magnetic tape described in Parts 303.6 and 303.7.
- One summary acreage calculation with a total polygon count for each map sheet.
- All of the original source materials. (See Part 303.4)

(b) Acreage calculations. Develop acreage calculations and a total polygon count for each soil map data set in 7 1/2 minute format, and a total calculation for all soil maps in the soil survey.

Print a computer generated hard copy of the acreage calculations from each soil map data set. Sort acreage calculations alphabetically or numerically by soil map symbol, water, and "Nodata". Show the acreages to the nearest .01 acre, as shown in the example below:

AaB	757.06
AbC	2,371.78
BcH	980.25
NoData	3,067.43
(etc.)	----

Water	532.19
Total Acres	----
Total Polygons	----

Calculate the total acreage within the map neatline including the areas outside the limit of soil survey that are labeled "Nodata", and summarize the acreages.

(c) Editing. A complete and detailed edit of the digitizing work is required. The state soil scientist is responsible for assuring the digital soil data matches the original soil survey. The digitized soil data must be carefully checked against the original soil maps to assure that all data was correctly and completely digitized.

(1) Generate the check plot with either ball pen (standard point) or wet ink, using a .010" line width on stable base mylar material. Plot all data within .005" of its coordinate location in the data base.

(2) Plot soil map symbols and special soil feature labels as a line of single stroke characters, height and width of 0.10." The soil map symbols should duplicate the upper and lower case sequence of the original soil maps. The digital origin points for the soil map symbols shall not appear on the check plots.

(3) Plot the digital origin points for special soil feature point locations (e.g., well, wet spots, etc.) at 0.030" in diameter.

(4) Plot soil boundaries, neatlines, limit of soil survey boundaries, and soil map symbols in black; water boundaries and water area names in blue; and special soil features and labels in green. Soil symbols that are unidentifiable and labeled as XXX, are to be plotted in red.

(5) Label the check plot with the appropriate data set name and plotting scale, at some point beyond the data set limits.

(6) Check plots are to be free of dirt, smudges, scratches, and other defects.

303.11 Definitions.

Arc-Node Digitizing. One method of digitizing points, lines, and polygons using a digitizing tablet.. The operator begins digitizing a line at a node, intersection or junction and stops at the next node, intersection or junction and records the coordinates. Also called line-segment digitizing.

Attribute. A characteristic of a site or phenomenon. Attribute data is linked or related to geographic data. For example, a soil name is linked to an attribute that describes the percentage of slope for the soil name.

Coordinate Pair. A set of cartesian coordinates describing the two-dimensional location of a point, line, or polygon feature in relation to the common coordinate system of the database.

Digital Line Graph (DLG). A comprehensive topological vector format data structure developed by the U.S. Geoglogical Survey. Often referred to as DLG, DLG3, DLG Optional format. Used for storing and distributing digital data.

Digitizing. The process of converting information shown on an analog map into digital format so the information can be stored in a computer.

Edge Matching. The comparison, graphic and digital adjustment of features to obtain agreement along the edges of adjoining map sheets.

Export. The process of transferring data or software from one system to another system.

Geographic Information System (GIS). A combination of software, hardware, data and people utilized to input, store, manipulate, analyze and display geographical and associated attribute information.

Geographic Coordinates. A spherical coordinate system for defining the position of points on the earth.

GRASS. The SCS geographic information system software called Geographical Resources Analysis Support System.

Grid-Cell Digitizing. The process of superimposing an overlay of grid cells on a resource map and recording the map resource attribute for each cell. Attribute information may be recorded on computer coding sheets or entered directly from a keyboard. Grid cells are usually expressed in acres.

Index Map. Maps which show the location or coverage of other maps. Such an index map is the soil survey map sheet index and the USGS topo quad index.

LTPlus. A software package, commonly referred to as LTPlus, co-developed by the USDA Soil Conservation Service and Forest Service. It is designed for processing imported scanned map files or files created using a tablet digitizing method in topologically structured point, line and polygon data file format. Vector data can be imported and exported in a variety of exchange formats.

Limit of Soil Survey. A boundary which marks the limit of soil survey mapping. The boundary usually coincides with a county boundary however it may also coincide with other political boundaries or general land office survey sections.
The limit of soil survey boundary may also be a unique boundary that does not coincide with other boundaries.

Line-Segment Digitizing. One of several methods to digitizing lines, points and polygons using a digitizing tablet. Digitizing a line begins at a node, intersection or junction and stops a the the next node, intersection or junction where coordinates are recorded.

Manual Digitizing. The process of converting an analog map or other graphic display into numeric format with the use of a digitizing tablet and manually tracing the input data with a cursor.

MAP-DEV. A sub-system within SCS-GRASS which digitizes maps in line-segment (arc-node) format. Also performs the import and export of digital data.

National Map Accuracy Standards. Official map accuracy standards established for general and large scale maps. The standards apply only to the horizontal and vertical qualities of the maps, not to aspects such as labeling errors, etc.

- Horizontal accuracy: For maps published a scales larger than 1:20,000 not more than 10 percent of well defined tested points shall be in error by 1/30 inch. For maps published at scales smaller than 1:20,000, the error limit shall be be 1/50 inch.

- Vertical accuracy: For contour maps at all publication scales not more than 10 percent of the elevations tested shall be in error by more than one-half the contour interval.

NATSGO. The National Soil Geographic database, the most general in scale of the three soil geographic databases. Mapped at a scale of 1:7,500,000. Also called the Major Land Resources Area Map.

Neatline. The line surrounding or limiting the image area of the map.

Node. Refers to the point (junction) where two or more line segments join together.

Orthophotoquad. Maps prepared from high-resolution aerial photographs which are corrected to eliminate the displacements of perspective, camera tilt and terrain relief. They are scale true, meet national map accuracy standards and permit you to make accurate linear or area measurements.

Polygon. A closed area that is described by a string of coordinates that represent the boundary of the area. The beginning and ending points are the same. A series of attributes are usually assigned to the set of boundary coordinates coordinates that make up the unit. A soil area is an example of a polygon.

Raster. A regular grid or array of cells covering a spatial area. A raster is often viewed as consisting of rows and columns of grid cells.

Raster Scanning. See Scanning.

Raster Digitizing. See Grid-Cell Digitizing and Scanning.

Rubber-sheeting. The process of computer fitting map data digitized from photobase maps (either rectified or unrectified) to planimetrically accurate orthophoto maps or USGS topographic quadrangles. The techniques involve rotation, scaling, stretching, translation and in some cases the use of analytical functions to register a map to fit to selected control points.

Scanning. The process of using a device, generally referred to as a scanner, to capture a raster copy of a map in a digital bit-map or binary format and saving it in a computer readable file. This process is also one approach to convert black and white or color aerial photography into a digital format depicting up to 256 shades of gray or a nearly infinite number of color shades and hues.

Spaghetti Digitizing. One method of digitizing lines and polygons using a digitizing tablet. The operator guides the digitizing tablet over the line work without regard to recording the x,y coordinates for line intersections or junctions. These junctions are recorded later through the use of software.

SCS-GEF. The Soil Conservation Service Geographic Exchange Format. A structured format for recording, storing and distributing digital data.

SSURGO. The Soil Survey Geographic database, the most detailed in scale of the three soil geographic databases. Mapping is generally done at scales of 1;12,000, 1;15,840, 1:20,000, 1:24,000 and 1:31,680.

STATSGO. The State Soil Geographic database. Mapped at a scale of 1:250,000 on USGS base maps.

Soil Area. A delineation of the mapped unit. The mapped unit is identified by a symbol. A soil boundary depicts the limit of the soil area (polygon).

Soil Legend. A list of the soil map symbols and their names.

Spatial Data. Data pertaining to the location of geographical entities together with their spatial dimensions. Spatial data are classified as point, line and polygon.

Topology. The order or relationship of specific items of data to other items of data.

Vector. A line showing the direction and distance between vertices. A vertex is the termination or intersection of lines or curves.

Vector Data. A form of digital data comprising x,y coordinate representations that are portrayed by points, lines (strings of points), or polygons (closed lines).

Vector Digitizing. See Line-Segment digitizing.

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