



National Mapping Program Technical Instructions

Part 1

General

Standards for Digital Raster Graphics

Standards for Digital Raster Graphics
Part 1: General

CONTENTS

	Page
1. GENERAL	1-1
1.1 PRODUCT DEFINITION	1-2
1.2 OBJECTIVES	1-3
1.3 PRODUCT DESCRIPTION	1-4
1.4 DATA SOURCES	1-6
 APPENDIX 1-A Definitions	 1A-1

Standards for Digital Raster Graphics
Part 1: General

LIST OF PAGES

A complete and current copy of Part 1 of the Standards for Digital Raster Graphics consists of the pages (and most recent creation or revision dates) listed below.

<u>Page</u>	<u>Date</u>	<u>Page</u>	<u>Date</u>	<u>Page</u>	<u>Date</u>
1-ii	4/01				
1-iii	4/01				
1-1	4/01				
1-2	4/01				
1-3	4/01				
1-4	4/01				
1-5	4/01				
1-6	4/01				
1A-1	4/01				
1A-2	4/01				
1A-3	4/01				
1A-4	4/01				

Standards for Digital Raster Graphics
Part 1: General

1. GENERAL

This part of the standard provides a general description of digital raster graphics.

Several terms used in this standard are defined in appendix 1-A.

Standards for Digital Raster Graphics
Part 1: General

1.1 PRODUCT DEFINITION

The term "digital raster graphic" (DRG) is used throughout this document to refer to a georeferenced, rectified image of a scanned U.S. Geological Survey (USGS) topographic or planimetric map. The term "DRG" was not invented by the USGS and is not owned by any data producer. The term is used by other data producers to describe data that may or may not conform to this standard. The USGS makes no claim that a USGS DRG is in any way superior to other scanned map products.

Standards for Digital Raster Graphics
Part 1: General

1.2 OBJECTIVES

The USGS is the lead Federal agency for the collection and distribution of base cartographic data. In addition to technical product specifications, this standard contains information about the collection, processing, and quality control of DRG data.

It is a USGS policy objective to have a DRG that matches every standard, current USGS topographic map at the scale of 1:10,000, 1:12,000, 1:24,000, 1:20,000, 1:25,000, 1:30,000, 1:63,360, 1:100,000, and 1:250,000. Actually achieving this objective is subject to funding availability and other programmatic constraints.

USGS DRGs are public domain data and may be freely copied and redistributed.

Standards for Digital Raster Graphics
Part 1: General

1.3 PRODUCT DESCRIPTION

The first phase of the USGS DRG program lasted from 1995 through 1998. This phase consisted of scanning the most recent version of every standard USGS topographic map sheet, georeferencing these images, and building databases of the resulting products. All DRGs were made by scanning published paper maps, and all conformed to one relatively narrow technical specification.

USGS DRGs are designed primarily for use in geographic information systems and other data analysis applications. Making the data easily adaptable to these applications and keeping file sizes as small as possible may seriously compromise image quality. DRG resolution is not adequate to duplicate the visual quality of a published paper map. Printing a DRG will never produce a map that looks as good as the published lithographic print.

The general characteristics of DRGs made to the original standard are as follows:

- These DRGs were made by scanning an entire paper map, including the map collar, legend, and any overedge or insets.
- Product resolution is 250 dots per inch (dpi).
- The image inside the neatline is usually georeferenced to the datum of the source map and projected to the Universal Transverse Mercator projection, regardless of the projection of the source map.
- DRGs preserve the horizontal accuracy of the source map but do not improve it.
- Colors of the scanned image are reduced to a standard color map of 13 colors. This color map models the line drawing nature of the source graphic.

Standards for Digital Raster Graphics
Part 1: General

- The physical format of DRG images is the Tagged Image File Format (TIFF), version 6.0.
- Georeferencing information is stored in the TIFF file according to the GeoTIFF standard, version 0.2 or version 1.0.
- Each DRG instance is composed of two physical files, a TIFF image file (*.tif) and a text file of metadata (*.fgd). This text file conforms to the Federal Geographic Data Committee (FGDC) metadata content standard.

All of these features of the original DRG standard are included in this current version of the standard, so all existing DRGs comply with this new standard. In addition, the current version of the standard allows (but does not require) DRGs to have the following different characteristics:

- The image may use a different color model as an alternative to the original reduced color map. In this alternative model, the TIFF image may have up to 256 colors, 255 of which may have any red-green-blue (RGB) values and be stored in any order. The image is still required to be an 8-bit color-palette image as defined by the TIFF 6.0 standard.
- The image may have a scan resolution of 250 dpi to 1,000 dpi.

Standards for Digital Raster Graphics
Part 1: General

1.4 DATA SOURCES

Original coverage DRGs were all made by scanning paper maps. New version DRGs are made from several data sources:

- (1) From scans of paper maps.
- (2) From the outputs of digital map revision processes.
- (3) From scans of the original map materials.

Standards for Digital Raster Graphics
Part 1: General
Appendix 1-A: Definitions

APPENDIX 1-A
Definitions

Standards for Digital Raster Graphics
Part 1: General
Appendix 1-A: Definitions

.d and .h = Number suffixes to indicate decimal and hexadecimal numbers respectively. For example, (262.d, 106.h) represent the same number, the first in base 10 and the second in base 16. In this standard, such number pairs are used to cross-reference TIFF and GeoTIFF tags.

Cell = A geographic quadrangle bounded by lines of latitude and longitude. A 7.5-minute cell (for example) has multiple products associated with it, including, possibly, several DRGs. Overedge areas and inset maps, though part of a map product, are not part of the standard cell.

Color map = An RGB look-up table that describes how data values map to colors. Pixel values are indexes into this look-up table.

Color slot = Positions in the TIFF color map. For a DRG, the color map contains 256 slots, numbered 0 through 255. (Note: this term is not used in the base TIFF standard.)

Compression = Used in this document to refer to any of the data compression methods supported by the TIFF standard.

CS = Coordinate system.

Georeference = To establish the relationship between an image coordinate system and a ground coordinate system.

Halftone = A technique of representing shading with dots produced by photographing the object from behind a fine screen.

Insets = Land areas, usually islands, that are printed inside a map neatline even though they are not part of the cell's geographic domain.

Map collar/DRG collar = The area of the map that lies outside the neatlines. The collar contains the map title, scale, grid

Standards for Digital Raster Graphics
Part 1: General
Appendix 1-A: Definitions

coordinate values, and map metadata.

Metadata = Information about the content, quality, lineage, and other characteristics of data. On a graphic map, metadata are printed in the map collar. A DRG contains small amounts of metadata in various TIFF and GeoTIFF tags, and additional digital metadata in a file physically separate from the map image file.

Neatline = The latitude and longitude lines defining the extent of the mapped area. Usually, but not always, the same as the boundaries of the standard map cell.

New version DRG = If a map cell already has a DRG, and a new or revised map of that cell is published, the DRG made from the new map is called a new version DRG. The previous DRG remains available for sale as historical data.

Original coverage DRG = A DRG made during the original DRG production program, 1995 through 1998. All DRGs during this period were made by scanning the most recent paper map for each standard cell. Most were scanned by private companies working through an innovative partnership agreement with the USGS.

Overedge = Mapped areas that are outside the boundaries of a standard USGS map cell. For example, a 7.5-minute map may have a sliver of extra area to include a State border, or it may have a small piece of coastline beyond the standard neatline.

Palette-color = One of the image types allowed by TIFF. This image type uses a color map, or look-up table. Pixel values are indexes into this full RGB color map.

PCS = Projected coordinate system (used by the GeoTIFF standard to reference combinations of datums, projections, and grid systems).

Standards for Digital Raster Graphics
Part 1: General
Appendix 1-A: Definitions

Replacement DRG = If an error is found in an existing DRG and a new DRG is made from the same map, the new DRG is called a replacement DRG. The previous DRG is simply bad data and is no longer available for sale.

Transformation = The conversion of image coordinates from one coordinate system to another. For the purposes of this standard, it is the process of correctly aligning (x,y) image coordinates with (X,Y) UTM coordinates.