

**USDA Service Center Agencies
Geospatial Data Management Team
Data Management Plan For
Topographic Images-Digital Raster Graphs**

**August 1999
Ron Selph and Steve Nechero**

I. Purpose and Scope (business case)

A. Purpose

A U.S. Geological Survey digital raster graphic (DRG) is a georeferenced, rectified image of a scanned USGS topographic or planimetric map. USGS DRGs are designed primarily for use in geographic information systems and other data analysis applications. DRG resolution is not adequate to duplicate the visual quality of a published paper map.

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, 1:100,00 and 1:250,000.

B. Scope

The scope is the 50 states of the United States, the District of Columbia, Puerto Rico, and territorial islands.

II. Acquisition

A. Data Source

1. Producer Information

a. Name

The term "digital raster graphic" (DRG) refers to a georeferenced, rectified raster image of a scanned U.S. Geological Survey (USGS) topographic or planimetric map. The DRG is a product of the USGS.

b. Location of Headquarters

US Geological Survey
523 National Center
Reston, VA 20192

c. Internet Address

www.usgs.gov

2. Publisher Information

a. Name

DRGs are published through a cooperative effort between the USGS, the Tennessee Valley Authority (TVA) and the Teale Data Center (TDC).

b. Location of Headquarters

USGS

1) Coverage Area consists of the conterminous United States (except portions of Alabama, Arkansas, California, Mississippi, North Carolina, and Tennessee), Alaska, Hawaii, Puerto Rico and the Virgin Islands, and Pacific Islands

2) Ordering Address

Rolla-Earth Science Information Center

1400 Independence Rd., MS231

Rolla, MO 65401-2602

Phone 573-308-3577

Facsimile 573-308-3652

TVA

1) Coverage Area consists of portions of Alabama, Arkansas, Mississippi, North Carolina and Tennessee

2) Ordering Address

Tennessee Valley Authority

1101 Market Street

Chattanooga, TN 3702-2801

Phone 800-627-7882

Facsimile 423-751-6216

TDC

1) Coverage Area consist of a portion of California

2) Ordering Address

Stephen P. Teale Data Center

GIS Solutions Group

P.O. Box 13436

Sacramento, CA 95813-4436

Facsimile 916-263-1346

c. Internet Address

USGS: E-mail to esic@mcmcmail.er.usgs.gov

<http://mcmcweb.er.usgs.gov/drg/>

TVA: E-mail to mapstore@tva.gov

<http://www.tva.gov/orgs/gie/maphome.htm>

TDC

<http://www.gislab.teale.ca.gov/>

3. Acquisition Information

a. Delivery Media

The principle form of delivery media for DRGs from the publishers is on CD-ROM. DRGs may also be delivered on 8mm cartridge tapes on request. Because of the large size of DRGs files, DRGs are not delivered via file transfer protocol (ftp) from the publisher. DRGs of some areas are offered free of charge via ftp from secondary sources.

b. Download URL

Nevada Bureau of Mines and Geology
1:100,000-Scale DRG's of Nevada
<http://www.nbm>

Pennsylvania 1:24,000, 1:100,000, and
1:250,000 scale topographic maps
<http://www.pasda.psu.edu/discover/data-types.shtml>

Texas Natural Resource Conservation Commission (TNRCC)
DRG's of Texas
<http://www.tnrcc.state.tx.us/gis/raster.html>

USGS-Environmental Management Technical Center
DRG's for parts of 8 upper mid-western states
http://www.emtc.nbs.gov/http_data/emtc_spatial/available_data/drg.html

West Virginia Division of Environmental Protection
DRG's for West Virginia
<http://www.dep.state.wv.us/metadata/index.html>

Florida Dept. of Environmental Protection - Land Boundary Information System
(LABINS)
DRG's for Florida
<http://www.labins.org/>

Wyoming Spatial Data Clearinghouse
DRG's for Wyoming
<http://wgiac.state.wy.us/wsdc/usgs/drg/AboutDRG.html>

Montana State Library - Natural Resource Information System DRG's for Montana
Pennsylvania Spatial Data Access
DRG's of all
<http://nris.state.mt.us/nsdi/drg.html>

Missouri Spatial Data Information Service
DRG's for Missouri
<http://msdis.missouri.edu/drglist.html>

Idaho Geospatial Data Center
DRG's for Idaho
<http://geolibrary.uidaho.edu/>

Spatial Analysis Lab, University of Arkansas at Monticello
DRG's for Arkansas
<http://ponderosa.uamont.edu/weih/quads/default.htm>

University of Nebraska-Lincoln
DRG's for Nebraska
<http://csd-esic.unl.edu/index.html>

State of Kansas GIS Initiative
DRG's for Kansas
<http://gisdasc.kgs.ukans.edu/>

- c. Projected Data Availability Schedule

All the DRGs produced by the USGS are currently available from the principle publishers and multiple commercial suppliers.

B. Standards Information

1. Geospatial Data Standard

- a. Standard Name and Steward Information

USGS

DRGs conform to the "Standards for Digital Raster Graphs" as delineated in the National Mapping Program Technical Instructions.

<http://rmmcweb.cr.usgs.gov/public/nmpstds/drgstds.html>

or

http://topomaps.usgs.gov/drg/drg_technical.html

TVA and TDC

No published standard

- b. Standard Version

USGS

The "Standards for Digital Raster Graphs" as delineated in the National Mapping Program Technical Instructions was late published in April 2001.

TVA and TDC

No published standard

- c. Standard URL

USGS

<http://rmmcweb.cr.usgs.gov/public/nmpstds/drgstds.html>

TVA and TDC

No published standard

2. Metadata Standard

- a. Standard Name and Steward Information

USGS

Content Standard for Digital Geospatial Metadata version 19940608

<http://rockyweb.cr.usgs.gov/nmpstds/metastds.html>

The metadata contact is:

U S Geological Survey

508 National Center

Reston, VA 22092 USA

TVA

Content Standard for Digital Geospatial Metadata version 19940608

The metadata contact is:

U.S. Tennessee Valley Authority

HB 2A-C, 1101 Market St.

Chattanooga, TN 37402-2801

TDC
No published standard

b. Description of Metadata Captured

USGS
The sections of the metadata include:

Identification Information
Data Quality Information
Spatial Data Organization Information
Spatial Reference Information
Entity and Attribute Information
Distribution Information
Metadata Reference Information

TVA
The sections of the metadata include:

Identification Information
Data Quality Information
Spatial Data Organization Information
Spatial Reference Information
Entity and Attribute Information
Distribution Information
Metadata Reference Information

TDC
The sections of the metadata include:

Coverage Identification and Description
Brief Methodology
Vital Statistics
Info File Descriptions
Entity and Attribute Information
Data Contact

c. Metadata Accuracy and Completeness Assessment

USGS
The metadata is complete. Additional information is available at the U.S. Geological Survey, 590 National Center, Reston, VA, 22092

TVA
The metadata is complete. Additional information is available at the U.S. Tennessee Valley Authority, Geographic Information and Engineering, HB 2A-C, 1101 Market St., Chattanooga, TN, 37402-2801

TDC
The metadata is not complete. Items found in published metadata are geospatial data, metadata standards, data quality information, and publication information.

C. Acquired Data Structure

1. Geospatial Data Format

a. Format (raster, vector, etc.)

Raster

b. Format Name

USGS: Tagged Image File Format (Geo-TIFF) Version 6.0

TVA: Tagged Image File Format (Geo-TIFF) Version 5.0

TDC: Tagged Image File Format (Geo-TIFF) Version 5.0

c. Data Extent

TDC includes insets covering the state of California.

The standard area of coverage is the entire area printed on a standard series topographic map including the map collar, any overedge areas, and insets. These standard series maps include:

7.5-minute map series: Conterminous United States, Hawaii, and limited areas of Alaska at 1:24,000 and 1:25,000 scale, except portions of Alabama, Arkansas, California, Mississippi, North Carolina, and Tennessee.

7.5- by 15-minute map series: Covers limited areas of the conterminous United States at 1:25,000 scale, except portions of Alabama, Arkansas, California, Mississippi, North Carolina, and Tennessee.

Pacific Island map series at 1:20,000, 1:24,000, and 1:25,000 scale.

Puerto Rico and the Virgin Islands at 1:20,000 scale.

Culebra, its adjacent islands, and the Island of Vieques at 1:30,000 scale.

Alaska at 1:63,360 scale.

30- by 60-minute map series: Conterminous United States and Hawaii at 1:100,000 scale, except portions of Alabama, Arkansas, Mississippi, North Carolina, and Tennessee.

1- by 2-degree map series: United States at 1:250,000 scale, except for portions of Alabama, Arkansas, Mississippi, North Carolina, and Tennessee.

USGS employs a standardized data set name (DSN) for its DRG products. The convention applied to the DRG products is:

CATEGORY + LAT/LONG OF SECONDARY CELL + MAP INDEX NUMBER

CATEGORY - One alpha character identifying the series, scale, and class of the DRG.

CATEGORY	SERIES	SCALE	CLASS
R	7.5	1:20,000	Topographic
O	7.5'	1:24,000	Topographic
P	7.5'	1:24,000	Orthophoto
L	7.5'	1:25,000	Topographic
J	7.5'	1:30,000	Topographic
K	7.5'X15'	1:25,000	Topographic
I	Alaska	1:63,360	Topographic
G	30'x60'	1:100,000	Planimetric
F	30'x60'	1:100,000	Topographic
C	1 x 2 Degree	1:250,000	Topographic

LAT/LONG OF SECONDARY CELL - Expressed in degrees of latitude (2 characters) and degrees of longitude (3 characters), defining the southeast corner (integer grid corner), of the secondary cell.

SECONDARY CELL - 1- by 1-degree cell (except Alaska) defined by integer latitude and longitude. Cells in Alaska vary in size, but are always identified by integer latitude and longitude.

MAP INDEX NUMBER - Two-character alphanumeric code locating the primary cell (quadrangle) within the secondary cell.

TIF - Tagged Image File Format (TIFF) - A tag based file format that is designed to promote the interchange of digital image data.

EXAMPLE: O37091H7.TIF = Rolla, Missouri, 7.5-minute, 1:24,000-scale Topographic Quadrangle

O = 7.5-minute, 1:24,000-scale Topographic Quadrangle
37 = Degrees Latitude
091 = Degrees Longitude
H7 = Map Index Number for the Rolla Quadrangle
TIF = Tagged Image File Format

d. Horizontal and Vertical Resolution

As a rule, the USGS used a scanner resolution of 500 dpi to produce DRGs. The ground pixel resolution of a raster graphic derived from a 7.5-minute topographic map scanned at 1,000 dpi is equivalent to approximately 2 feet (500 dpi is approximately 4 feet; 250 dpi is approximately 7.9 feet). After resampling, the resolution of the final DRG is 250 dpi.

TVA uses a scanner resolution of 500 dpi to produce DRGs. The ground pixel resolution of a raster graphic derived from a 7.5-minute topographic map scanned at 1,000 dpi is equivalent to approximately 2 feet (500 dpi is approximately 4 feet; 250 dpi resolution is 2.4 meters (8.0 feet). After sub-sampling, the resolution of the final DRG is 250 dpi.

TDC uses a scanner resolution of 400 dpi was used to produce the DRGs. Ground resolution was not specified.

e. Absolute Horizontal and Vertical Accuracy

DRGs retain the horizontal accuracy of the source maps. Most USGS printed maps contain the National Map Accuracy Standards (NMAS) note in the collar area. The NMAS states that for maps on publication scales of 1:20,000 or smaller, not more than 10 percent of the points tested shall be in error by more than 1/50 inch measured on the publication scale.

f. Nominal Scale

1:20,000-, 1:24,000-, 1:25,000-, 1:30,000-, 1:63,360-, 1:100,000- and 1:250,000-scale

TDC: 1:24,000-, 1:25,000-scale

g. Horizontal and Vertical Datum

The horizontal datum of the DRG (either North American Datum of 1927 or 1983) is not changed by the UTM projection and will be the same as the published source map.

TVA and TDC have all North American Datum of 1927.

h. Projection

The USGS DRG is cast on the UTM projection. This is consistent with other USGS digital data series cast on the UTM projection. However, this makes the image inconsistent with the projection statement on the source map collar because most 7.5-minute topographic maps were projected on either Lambert conformal conic or transverse mercator, using the appropriate state plane coordinate system.

TVA is all Universal Transverse Mercator.

TDC uses Albers with a -4,000,000 False Northing (Y shift)

i. Coordinate Units

degrees, minutes, seconds

j. Average Data Set Size

USGS and TVA have an average output file is between 3-18 MB in size. At TDC the average output file is between 2-40 MB in size, 13 MB on average per image.

k. Symbology

None

2. Attribute Data Format

a. Format Name

N/A - Raster

b. Database Size

N/A - Raster

3. Data Model

a. Geospatial Data Structure

The USGS DRGs employ an 8-bit PackBits compressed Tagged Image File Format (TIFF), palette color format. DRGs use GeoTIFF tag (the field identifier) specifications to describe the georeferencing or geocoding of the DRG raster images.

The orientation of data is by rows and columns. Row and column 1, 1 of the DRG will be in the upper left-hand corner of the collar area, not the northwest neatline corner of the mapped area. Each row contains a series of pixels ordered from west to east. The order of the rows is from north to south. When displayed on a computer graphics terminal, projection grid north is at the top. However, the image is displayed in its proper UTM configuration and, therefore, may not be parallel with the outer edges of the DRG collar. The text and figures within the collar area of the DRG may be distorted depending on how far the DRG lies from the central meridian of its respective UTM zone, that is, the closer to the central meridian.

Each DRG has an accompanying 'world' file with the same file name, but with a .tfw extension, that contains geo-referencing information:

example:	o35116a7.tfw
2.43840000000000	pixel size (meters)
0.00000000000000	rotation factor
0.00000000000000	rotation factor
-2.43840000000000	pixel size
284543.57694197021192	image min x (meters) (NW Corner)
-316411.17369714472443	image max y (meters) (NW Corner)

TVA is the same as USGS described above except TIFF not GeoTIFF.

TDC DRGs are PackBit-compressed tiff images of USGS 7.5 minute quadrangle maps. Each DRG has a 'world' file with the same file name, but with a .tfw extension that contains geo-referencing information:

example:	o35116a7.tfw
1.52786215012960	pixel size (meters)
0.00000000000000	rotation factor
0.00000000000000	rotation factor
-1.52786215012960	pixel size
284543.57694197021192	image min x (meters) (NW Corner)
-316411.17369714472443	image max y (meters) (NW Corner)

The min x and min y coordinates relate to the image itself, and not the latitude longitude values at the map corner.

b. Attribute Data Structure

Six inks are employed on a USGS topographic map; screen printing processes can create more than six defined colors. The USGS DRGs employ a color palette, or look-up table, consisting of 13 colors depending on the map series and whether or not the scanned image is descreened. Three numbers define the digital number in the

palette: one each for red, green, and blue and each separately defined as a value from 0 through 255. The colors defined in the color look-up table are chosen to represent as closely as possible the colors of the printed map within a map series.

TVA is the same as USGS described above.

TDC colors on the DRGs have been normalized to 13 RGB values.

c. Database Table Definition

The USGS and TVA DRG Color Palette

Digital Number	Color	Red	Green	Blue
0	Black	0	0	0
1	White	255	255	255
2	Blue	0	151	164
3	Red	203	0	23
4	Brown	131	66	37
5	Green	201	234	157
6	Purple	137	51	128
7	Yellow	255	234	0
8	Light Blue	167	226	226
9	Light Red	255	184	184
10	Light Purple	218	179	214
11	Light Grey	209	209	209
12	Light Brown	207	164	142

TDC Color Palette

Red	Green	Blue	Color
0	0	0	black
255	255	255	white
91	159	230	dark blue
230	45	30	red
162	96	71	dark brown
210	255	177	green
197	101	197	dark magenta
255	240	0	yellow
202	225	245	light blue
255	202	197	light red
250	202	250	light magenta
230	230	230	light grey
222	167	146	light brown

d. Data Relationship Definition

The digital number of each pixel represents one of the standard color values listed on the color palette.

e. Data Dictionary

Color palette - a look-up table that describes how data values map to colors.

Descreening - the process of replacing or removing the lithographic screen (half-tone) pattern found on the source map and substituting, in digital raster graphic form, a solid area color of a light or transparent shade and hue. The area color may be represented within the raster graphic by a background color of much lighter shade and hue than the primary foreground feature colors. The intent is to replicate as closely as possible the original screened half-tone color found on the source map.

D. Policies

1. Restrictions

a. Use Constraints

USGS requests acknowledgment of the USGS would be appreciated in products derived from these data.

TVA requests acknowledgment of the U.S. Tennessee Valley Authority, Geographic Partnerships Program would be appreciated in products derived from these data.

TDC requests acknowledgment of the Teale Data Center would be appreciated in products derived from these data.

b. Access Constraints

None

c. Certification Issues

None

2. Maintenance

a. Temporal Information

Unknown - Not addressed

b. Average Update Cycle

Unknown - Not addressed

See:

http://topomaps.usgs.gov/drg/duplicate_drg.html

for a list of USGS DRGs produced after January 1, 1999, the end of the original once-over DRG coverage and the beginning of the program's maintenance phase. The list is organized by the month and year the DRG was entered in the USGS archive, starting with the most recent. Within each month, the list is alphabetical by state and then by quad name. To request a delimited plain-text version of this list, send email to lmoore@usgs.gov

E. Acquisition Cost

1. Cooperative Agreement

a. Description of Agreement

None

b. Status of Agreement

N/A

2. Cost to Acquire Data

At the time of purchase the cost from USGS was \$32.00 per CD-ROM with a \$3.50 handling charge per order. Usually all the maps in a one degree block were placed on one CD-ROM. However if two CD-ROMS were required to cover a one degree block, the cost for the two CD-ROMs was \$42.00 plus shipping. Currently DRG orders are filled on demand. There is a base charge of \$45.00 per order, plus \$3.50 shipping, plus \$1.00 for each DRG quadrangle purchased. Sale of DRGs in fixed 1-degree blocks were discontinued on October 1, 1998. USGS does not offer DRGs trimmed of collars or seamless.

The purchase cost of DRGs from TVA is \$100.00 per CD-ROM. There is no handling charge. Most CD-ROMs cover a one degree block. For those block that require two CD-ROMs cost remains \$100.00 per CD-ROM. TVA does offer DRGs in Tennessee State Plane projection and seamless.

The DRGs from the Teale Data Center were acquired on 8mm tapes. The cost to receive the DRGs in this format was based on an hourly rate of \$50.00 per hour for 21 hours. A \$10.00 handling fee was assessed. The more common means of acquiring DRGs from TDC are by CD-ROM. CDs are \$6.00 each, plus a \$105.00 per order processing charge, plus shipping (\$10 - \$20). Cost for the entire state is \$600.00 delivered. Custom CDs containing any combination of up to 30 quads. Cost is \$54.00 per CD, plus \$10.00 shipping. TDC also offers DRGs trimmed of collars or seamless.

III. Integration

A. *Value Added Process*

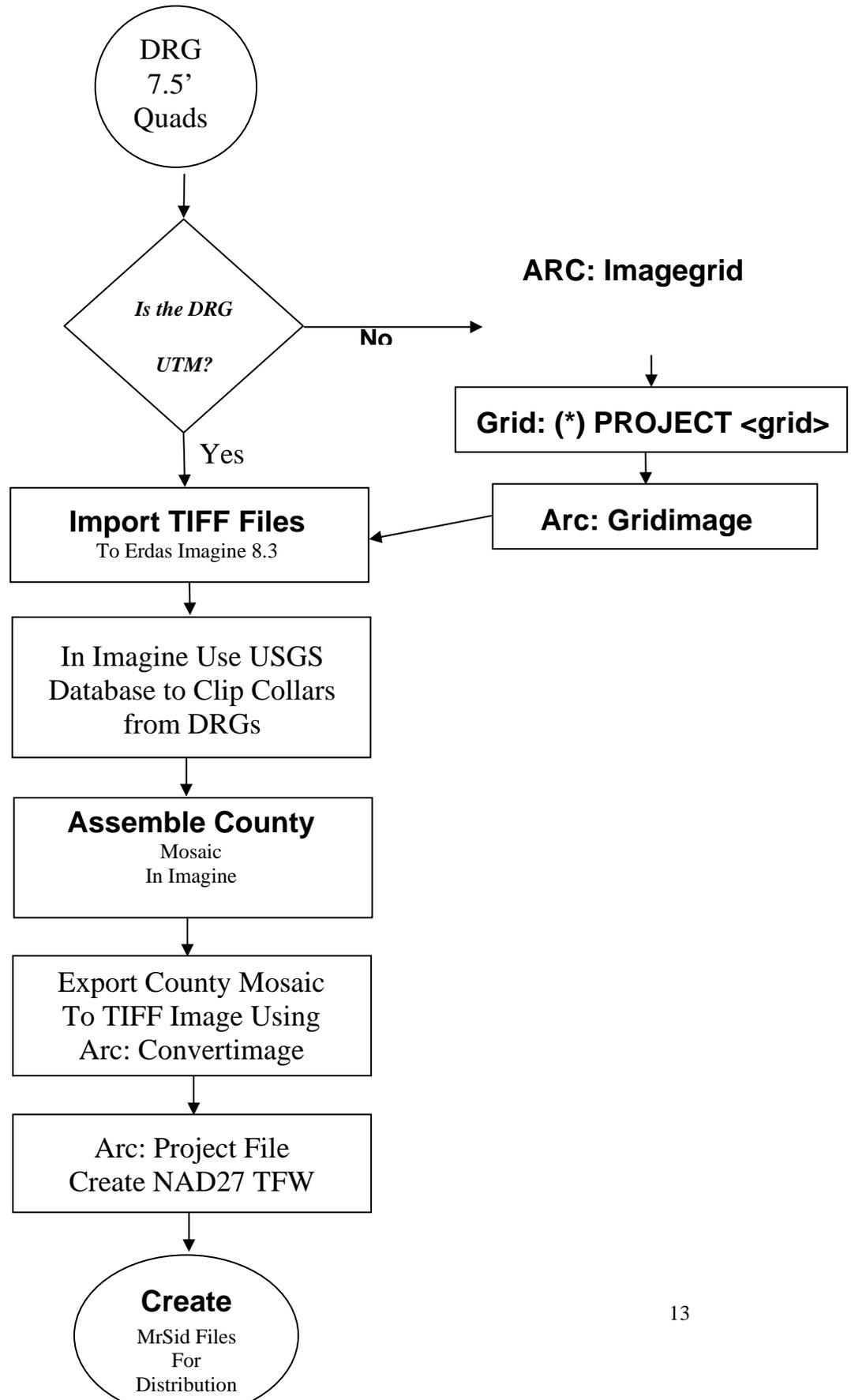
1. Benefit to the Service Center

The county mosaic of the DRG serves a useful backdrop onto which other digital data may be overlaid. The DRG mosaic provides the service center with a georeferenced base to evaluate, orient and collect data. With geographical, political and cultural data at hand the DRG provides invaluable and timely cartographic information.

2. Process Model

a. Flow Diagram

Digital Raster Graph Process



b. Process Description

- Move 7.5' DRGs to workspace
- Pre-Process Teale Data Center DRGs(see process below)
- Import TIFF files into Imagine 8.3
- Clip collars from DRGs utilizing USGS database resident in Imagine
- Assemble clipped (seamless) DRGs into county mosaic
- Export mosaiced county Imagine file back to a TIFF file using the ARC/INFO command 'CONVERTIMAGE' with the compression option
- Reproject to NAD83
- Further compress the county mosaic with Mr.Sid

Teale Data Center Pre-Process Routine (TDC DRGs are Albers projection with a -4,000,000 y-shift)

- In ARC/INFO, convert the TIFF image to a grid
- In GRID, reproject the file to UTM NAD27, 0 y-shift
- In ARC/INFO, convert the grid image back to a TIFF image (images now may be process like other TIFF images)

3. Technical Issues

a. Tiling

The original data comes in 7.5 minute quadrangle sheets. All the quadrangles covering a particular county are paneled together to provide a full county mosaic in one file.

b. Compression

The full county mosaic is compressed twice. The first time it is compressed as a function of the ARC/INFO command 'convertimage.' The second compression is done with Mr.Sid image compression software.

c. Scale

All county mosaics to date have been 1:24,000

d. Tonal Matching

Color tone matching from quad to quad within the mosaic are dependent on the colors used in the source maps, the quality of the scans, and the values utilized in the color palettes by the producer. The most extreme of the mismatches occurs when provisional quads are found with in the mosaic.

e. Edge-matching

Edge-matching is dependent on the accuracy of the clipping of the collars from the DRGs. The most satisfactory method found to date is to remove collars from DRGs by utilizing the USGS UTM data base found in ERDAS Imagine 8.3. Individual DRGs are clipped by selecting the UTM values of that quad found in the USGS database. The selection is then inverted (this selects everything outside the original quad) and mosaic process is then run. When this process is run on individual adjacent quads, the edge-matching that occurs within the mosaic has been excellent.

Any differences in edge-matching can be attributed to discrepancies in the source material.

4. Quality Control

a. Procedures

The quality of the county DRG mosaic has been to cross-check it by over-laying the mosaic with other digital layers.

b. Acceptance Criteria

If the data layer that are laid over the county DRG mosaic fit, the accuracy of the mosaic it accepted.

5. Data Steward

a. Name and Organization

The current data steward for the county DRG mosaic is:

National Cartography and Geospatial Center
Natural Resources Conservation Service
US Department of Agriculture
501 Felix Street, Building 23
P.O. Box 6567
Fort Worth, TX 76115-0567 USA

b. Responsibilities

The accuracy and distribution of the original DRGs remains with USGS, TVA and TDC. The content, accuracy and quality of the county mosaic are that of the National Cartography and Geospatial Center.

B. Integrated Data Structure

1. Geospatial Data Format

a. Format (raster, vector, etc.)

Raster - TIFF Image, compressed with Mr.Sid.

b. Format Name

Tagged Image File Format Versions 5.0 and 6.0

c. Data Extent

Individual county

d. Horizontal and Vertical Resolution

Same as source data

e. Absolute Horizontal and Vertical Accuracy

Same as source data

f. Nominal Scale

To date all county DRG mosaics have been 1:24,000.

g. Horizontal and Vertical Datum

The horizontal datum is the North American Datum (NAD) 83. The vertical datum is mean sea level.

h. Projection

Universal Transverse Mercator (UTM), North American Datum (NAD) 83

i. Coordinate Units

degrees, minutes, seconds

j. Symbology

None

2. Attribute Data Format

a. Format Name

TIFF Image, compressed with Mr.Sid

b. Database Size

The size of the file will vary according to the number individual DRGs compiled to form the county mosaic. File sizes will vary from 3 MB on the larger counties to 5 MB per sheet on smaller counties, i.e. a 10 sheet mosaic will yield about a 50 MB Mr.Sid file and a 70 sheet mosaic will yield about a 210 MB Mr.Sid file.

3. Data Model

a. Geospatial Data Structure

Each county mosaic will contain a TIFF file (.tif) and world reference file (.tfw) in MrSid compressed form of drgname.sid and drgname.sdw

The 'world' file contains geo-referencing information:

example:	o35116a7.tfw
2.43840000000000	pixel size (meters)
0.00000000000000	rotation factor
0.00000000000000	rotation factor
-2.43840000000000	pixel size
284543.57694197021192	image min x (meters) (NW Corner)
-316411.17369714472443	image max y (meters) (NW Corner)

b. Attribute Data Structure

The 13 RGB color values of the USGS color table are utilized on the final mosaic.

c. Database Table Definition

(same as TDC Color Palette)

Red	Green	Blue	Color
0	0	0	black
255	255	255	white
91	159	230	dark blue
230	45	30	red
162	96	71	dark brown
210	255	177	green
197	101	197	dark magenta
255	240	0	yellow
202	225	245	light blue
255	202	197	light red
250	202	250	light magenta
230	230	230	light grey
222	167	146	light brown

d. Data Relationship Definition

The digital number of each pixel represents one of the standard color values listed on the color palette.

e. Data Dictionary

None given

C. Resource Requirements

1. Hardware and Software

Because of the large size of multiple raster files a UNIX or NT machine with a fast processor, 128 MB of RAM and 2 GB hard disk are necessary. The software needed includes Arc/Info with the Grid module and Erdas Imagine.

2. Staffing

The complete process of locating and moving the individual DRG file to a workspace would take approximately 1/2 per sheet.

D. Integration Cost

1. Hardware and Software

Because of the large size of multiple raster files a UNIX or NT machine with a fast processor, 128 MB of RAM and 2 GB hard disk are necessary. The software needed includes Arc/Info with the Grid module and Erdas Imagine.

2. Staffing

The completed mosaic ranges from approximately 2 hours per quad DRG for small jobs and 3/4 hour per quad DRG for larger jobs. i.e.- 6 hours for a 3 quad DRG mosaic.

IV. Delivery

A. Specifications

1. Directory Structure

- a. Folder Theme Data is Stored In

\Digital Raster Graphs

2. File Naming Convention

- a. List of Theme Files and The File Naming Convention

\drgnnnnn.sdw

\drgnnnnn.sid

where nnnnn = <Strips><CoFIPS>

B. User Information

1. Accuracy Assessment

- a. Alignment with Other Theme Geospatial Data

The mosaic county DRG should retain the horizontal accuracy of the source maps. Since DRGs meet the National Map Accuracy Standards (NMAS), the mosaic can be used to check the accuracy of other digital data sets.

- b. Content

Includes everything inside the topographical DRG map neatlines for the quads covering the county under study.

2. Appropriate Uses of the Geospatial Data

- a. Display Scale

The original data source scale or smaller, usually 1:24,000.

- b. Plot Scale

The original data source scale or smaller, usually 1:24,000.

- c. Area Calculations

With appropriate GIS software areas of polygons may be calculated.

- d. Decision Making

The DRG mosaic may be used for collection of data, evaluation and revision of existing data, and quality control of other digital data sets.

C. Maintenance and Updating

1. Recommendations and Guidelines

- a. Frequency of Updates

Update as USGS updates the current set of DRGs

b. Location for the Theme Data to be Maintained

- At the USGS, with USGS as the data steward
- At the NCG, online on two jukeboxes
- At the NCG, duplicate set of DRGs in Geospatial Data Branch

c. Maintenance and Updating Procedures Overview

Update data set as they become available from USGS