

**USDA Service Center Initiative
Geospatial Data Acquisition, Integration and Delivery
Business Re-engineering Project**

Data Themes - Outline - Elevation (30m DEM)

I. Acquisition

A. Data Source

1. Producer Information

a. Name

The 7.5 minute Digital Elevation Model (DEM) data files are digital representations of cartographic information in a raster form. DEMs consist of a sampled array of elevations for a number of ground positions at regularly spaced intervals. The U.S. Geological Survey (USGS) produces these digital cartographic/geographic data files as part of the National Mapping Program. DEM data for 7.5 minute units correspond to the USGS 7.5 minute topographic quadrangle map series for all of the United States and its territories except Alaska. Each 7.5 minute DEM is based on 30- by 30-meter data spacing with the Universal Transverse Mercator UTM projection. Each 7.5 by 7.5 minute block provides the same coverage as the standard USGS 7.5 minute map series.

b. Location of Headquarters

For up-to-date information contact the nearest Earth Science Information Center (ESIC).

Anchorage-ESIC
U.S. Geological Survey
4230 University Drive, Room 10
Anchorage, AK 99508-4664
(907) 786-7011

Reston-ESIC
U.S. Geological Survey
Room 1C402
507 National Center
Reston, VA 22092
(703) 648-6045

Lakewood-ESIC
U.S. Geological Survey
Rocky Mountain Mapping Center
Box 25046, Federal
(303) 236-5829

Rolla-ESIC
U.S. Geological Survey
1400 Independence Road
Rolla, MO 65401
(314) 341-0851

Menlo Park-ESIC
U.S. Geological Survey
Room 3128, Building 3 (MS 533)
345 Middlefield Road
Menlo Park, CA 94025
(415) 329-4309

Sioux Falls -ESIC
U.S. Geological Survey
Sioux Falls, SD 57198
(605) 594-6151

c. Internet Address

http://mapping.usgs.gov/esic/esic_index.html
<http://nsdi.usgs.gov/nsdi/>

2. Publisher Information

a. Name

U.S. Geological Survey, 804 National Center, Reston, VA 20192, USA
<http://www.usgs.gov>

b. Location of Headquarters

Anchorage-ESIC
U.S. Geological Survey
4230 University Drive, Room 10
Anchorage, AK 99508-4664
(907) 786-7011

Reston-ESIC
U.S. Geological Survey
Room 1C402
507 National Center
Reston, VA 22092
(703) 648-6045

Lakewood-ESIC
U.S. Geological Survey
Rocky Mountain Mapping Center
Box 25046, Federal
(303) 236-5829

Rolla-ESIC
U.S. Geological Survey
1400 Independence Road
Rolla, MO 65401
(314) 341-0851

Menlo Park-ESIC
U.S. Geological Survey
Room 3128, Building 3 (MS 533)
345 Middlefield Road
Menlo Park, CA 94025
(415) 329-4309

Sioux Falls -ESIC
U.S. Geological Survey
Sioux Falls, SD 57198
(605) 594-6151

c. Internet Address

<http://www.usgs.gov>

3. Acquisition Information

a. Delivery Media

The online copy of the data set (when available electronically) may be accessed without charge from USGS.

http://edcwww.cr.usgs.gov/doc/edchome/ndcdb/7_min_dem/states.html

Some 7.5 minute DEMS are available for distribution to those entities served by NCGC over the Internet via FTP. Contact: nrcs_data@ftw.nrcs.usda.gov.

b. Download URL

http://edcwww.cr.usgs.gov/doc/edchome/ndcdb/7_min_dem/states.html

c. Projected Data Availability Schedule

A status map developed for 30m 7.5 minute DEM available at NCGC is currently under development.

Status of 10m and 30m DEMS available for purchase from USGS at:

http://mcmcweb.er.usgs.gov/status/dem_stat.html

B. Standards Information

1. Geospatial Data Standard

a. Standard Name and Steward Information

Information on DEM specifications can be found in U.S. Department of the Interior U.S. Geological Survey, 1992, Standards for digital elevation models: Reston, VA. Copies of these standards in postscript, Word Perfect 5.0 and ASCII text formats are available through an Internet anonymous File Transfer Protocol (FTP) account at NMD.

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

2. Metadata Standard

a. Standard Name and Steward Information

Metadata Standard Name: Content Standards for Digital Geospatial Metadata
Metadata Standard Version: 19940608

b. Description of Metadata Captured

Metadata for the 7.5 minute digital elevation model holdings of the USGS for the conterminous United States are at a data-set level implementation and will be in place until file-specific information for individual digital elevation models is available.

<http://nsdi.usgs.gov/nsdi/wais/maps/dem75.HTML>

c. Metadata Accuracy and Completeness Assessment

C. Acquired Data Structure

1. Geospatial Data Format

a. Format (raster, vector, etc.)

The map data is raster.

b. Format Name

USGS DEM

c. Data Extent

The 7.5 minute UTM DEMs are available for the contiguous United States, Hawaii, and Puerto Rico. Coverage for the contiguous United States may be viewed on a current status coverage map

d. Horizontal and Vertical Resolution

DEM data are stored as profiles in which the spacing of the elevations along and between each profile is 30 meters. The number of elevations between each profile will differ because of the variable angle between the quadrangle's true north and the grid north of the UTM coordinate system.

DEM data of low-relief terrain or generated from contour maps with intervals of 10 feet or less are recorded in feet while DEM data of moderate to high-relief terrain or generated from maps with terrain contour intervals greater than 10 feet are generally recorded in meters.

e. Absolute Horizontal and Vertical Accuracy

HORIZONTAL POSITIONAL ACCURACY

Horizontal positional accuracy is based upon the use of USGS source quadrangles, which are compiled to meet National Map Accuracy Standards (NMAS). NMAS horizontal accuracy requires that at least 90 percent of points tested are within 0.02 inches of the true position. The digital data are estimated to contain a horizontal positional error of less than or equal to 0.003 inches standard error in the two component directions relative to the source quadrangle.

VERTICAL POSITIONAL ACCURACY

Vertical positional accuracy is based upon the use of USGS source quadrangles, which are compiled to meet National Map Accuracy Standards (NMAS). NMAS vertical accuracy requires that at least 90 percent of well-defined points tested be within one half contour interval of the correct value. Comparison to the graphic source is used as control to assess digital positional accuracy.

The method of determining 7.5 minute DEM accuracy involves computation of the root-mean-square error (RMSE) for linearly interpolated elevations in the DEM and corresponding "true" elevations from the published maps. Test points are well distributed and representative of the terrain.

A minimum of 28 test points per DEM is required (20 interior points and 8 edge points). Collection of test point data and comparison of the DEM to the quadrangle hypsography are conducted by the quality-control groups within the USGS.

f. Nominal Scale

1:24,000.

g. Horizontal and Vertical Datum

The reference data may be North American Datum of 1927 (NAD 27), North American Datum of 1983, (NAD 83), Old Hawaiian Datum (OHD), or Puerto Rico Datum (PRD) of 1940.

h. Projection

Each 7.5 minute unit of DEM coverage (based on the 7.5 minute quadrangle) consists of a regular array of elevations referenced horizontally in the Universal Transverse Mercator Projection coordinate system.

i. Coordinate Units

Coordinates for quadrangles are in UTM meters.

j. Average Data Set Size

7.5 minute 30m DEM files are between one and 1.5 megabytes

k. Symbology

None

2. Attribute Data Format

a. Format Name

N/A - Raster data.

b. Database Size

N/A

3. Data Model

a. Geospatial Data Structure

The digital elevation model is composed of a 6-character integer raster representing a gridded form of a topographic map hypsography overlay. Each raster entity contains a 6-character integer value between -32,767 to 32,768.

Level-1 DEMs are elevation data sets in a standardized format. The intent is to reserve this level for 7.5 minute DEMs which are created by scanning National High Altitude Photography (NHAP)/NAPP photography. A vertical RMSE of 7 meters is the desired accuracy standard. A RMSE of 15 meters is the maximum permitted.

b. Attribute Data Structure

N/A - Raster data

c. Database Table Definition

N/A - Raster data.

d. Data Relationship Definition

N/A - Raster data.

b. Data Dictionary

Entity and Attribute Detail Citation:

U.S. Department of the Interior, U.S. Geological Survey, 1992,
Standards for digital elevation models: Reston, VA,

A hypertext version is available at:

ftp://nmdpow9.er.usgs.gov/public/dem_html/standards_dem.html

D. Policies

1. Restrictions

a. Use Constraints

None

b. Access Constraints

None

c. Certification Issues

None

2. Maintenance

a. Temporal Information

Range of Dates/Times:
Beginning Date: 1979 07
Ending Date: present

b. Average Update Cycle

Periodic

E. Acquisition Cost

1. Cooperative Agreement

a. Description of Agreement

None

b. Status of Agreement

None

2. Cost to Acquire Data

FTP is free for electronically available data.

II. Integration

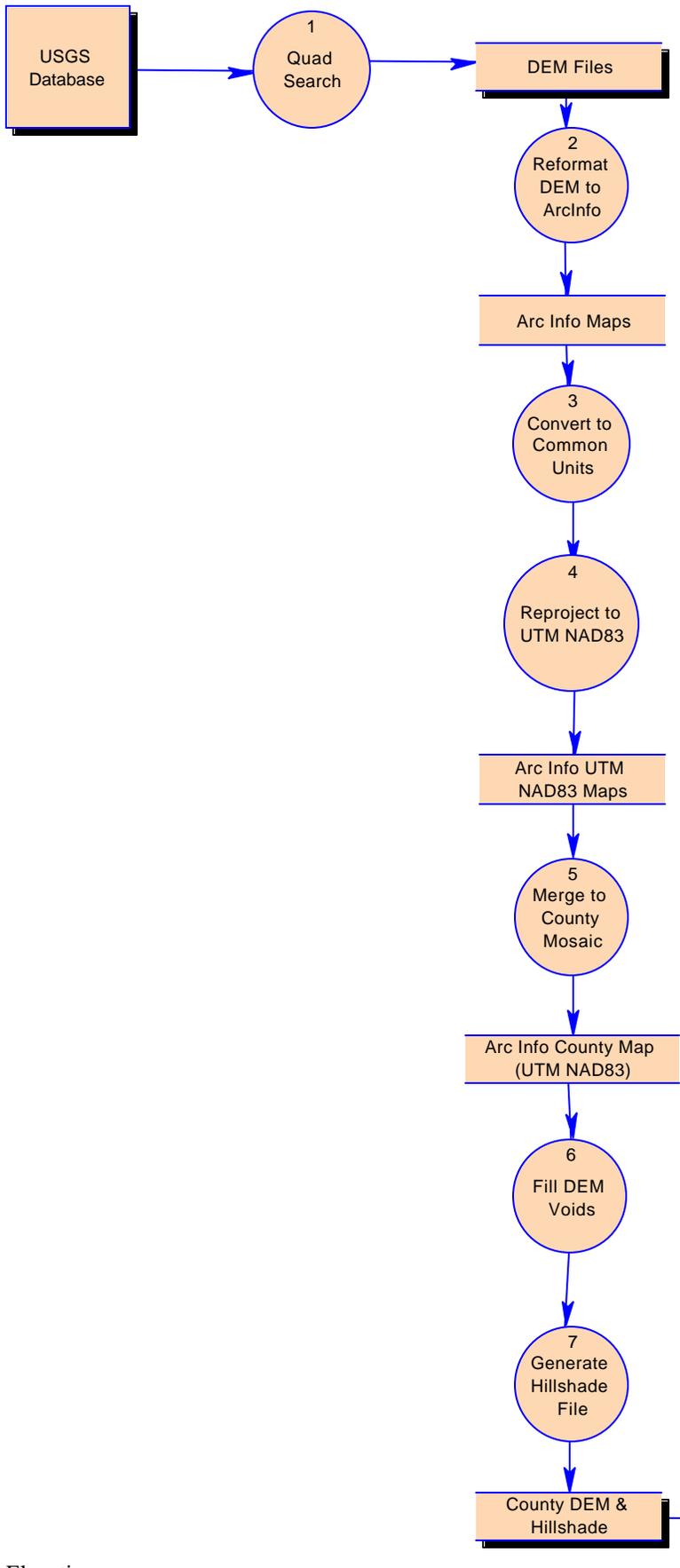
A. Value Added Process

1. Benefit to the Service Center

Data derived from 30m DEMS has diminutive value for large-scale analysis applications as needed in the field service center. Contours derived from 30m DEM data are too general and lack the detail observed on the Digital Raster Graph of the USGS TopoQuad. Hillshade images have been created that provide a distinguishable small-scale landscape image of the service center area.

2. Process Model

a. Flow Diagram



Process Model		
Project : Data AID		
Model : EROS Quads Process Model		
Author : Randy Frosh	Version 1.1	6/25/99

Elevation

b. Process Description

1. Obtain available DEMS for Service Center area from USGS
2. Export into ArcInfo
3. If all elevation units are not the same, then convert to common units
4. Project from NAD27 to NAD83
5. Mosaic DEMS to obtain one file for the SC area.
6. Attempt to fill any voids in the data.
7. Create image or shapefile of DEM application.
8. Cut CD-ROM and mail to the Service Center.

3. Technical Issues

a. Tiling

DEMS are produced on a 7.5 minute format corresponding to topographic quads. Temporal differences may exist between adjacent data sets within the Service Center area resulting in poor joins at the quad boundaries, different elevation units, detail, and quality.

b. Compression

None

c. Scale

The DEM data used for the purpose of determining elevation must be considered general and not used at a scale larger than 1: 48,000.

d. Tonal Matching

Temporal differences may exist between adjacent data sets within the Service Center area resulting in poor joins at the quad boundaries different elevation units, detail, and quality.

e. Edge-matching

Temporal differences may exist between adjacent data sets within the Service Center area resulting in poor joins at the quad boundaries different elevation units, detail, and quality.

4. Quality Control

a. Procedures

This is to be decided.

b. Acceptance Criteria

This is to be decided.

5. Data Steward

a. Name and Organization

Currently, the data steward for the integrated data 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, Texas 76115-0567 USA

- b. Responsibilities

This is to be decided.

B. Integrated Data Structure

1. Geospatial Data Format

- a. Format (raster, vector, etc.)

Raster, derived data can be vector, e.g., contours.

- b. Format Name

ESRI grid

- c. Data Extent

Service Center Area.

- d. Horizontal and Vertical Resolution

Same as source data.

- e. Absolute Horizontal and Vertical Accuracy

Same as source data.

- f. Nominal Scale

Same as source data.

- 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

Meters

- j. Symbology

None.

2. Attribute Data Format

- a. Format Name

N/A.

- b. Database Size

N/A.

3. Data Model

- a. Geospatial Data Structure

Image
hillshade.tif

Line Files	
map shp	shp file
map dbf	dbf file
map shx	shx file
map sbn	sbn file
map sbx	sbx file

- b. Attribute Data Structure

N/A

- c. Database Table Definition

N/A

- d. Data Relationship Definition

N/A

- e. Data Dictionary

N/A

C. Resource Requirements

1. Hardware and Software

To acquire and integrate one set of Service Center Area DEM data, a minimum of one UNIX or NT machine with approximately 5-gigabyte of disk is required.

2. Staffing

This is unknown at this time. If the access and integration can be completely automated, it would only require personnel to periodically check the results.

D. Integration Cost

1. Hardware and Software

To reformat, reproject, and subset the dataset a minimum the following is required:
Arc/Info on UNIX or NT platform
ArcView on NT platform
5-gigabyte disk

2. Staffing

This is unknown at this time.

III. Delivery

A. Specifications

1. Directory Structure

a. Folder Theme Data is Stored In

(Version 5)
\Service Center Themes
 \Elevation
 \contours
 \hillshade.tif

2. File Naming Convention

a. List of Theme Files and The File Naming Convention

\contours.dbf
\contours.shx
\contours.shp

\hillshade.tif
\hillshade.tifw

B. User Information

1. Accuracy Assessment

- a. Alignment with Other Theme Geospatial Data
The data is captured at a scales of 1:24,000. This elevation data should be considered not sufficiently detailed for the purpose of analysis at large scales. Alignment with the other data layers will not be perfect due to the fact that the data is captured at different scales.
- b. Content
This elevation data should be considered not sufficiently detailed for the purpose of analysis at large scales.

2. Appropriate Uses of the Geospatial Data

a. Display Scale

For the hillshade image, the scale of 1:48,000 or smaller.
For the contours, the original data source scale or smaller, usually 1:24,000.

b. Plot Scale

For the hillshade image, the scale of 1:48,000 or smaller.
For the contours, the original data source scale or smaller, usually 1:24,000.

c. Area Calculations

As accurate as the source data and capture scale and the algorithm used by ArcInfo/ArcView.

d. Decision Making

As accurate as the source data and capture scale and the algorithm used by ArcInfo/ArcView.

C. Maintenance and Updating

1. Recommendations and Guidelines

a. Frequency of Updates

Update the Service Center data whenever a DEM data set is prepared at higher resolution.

Develop elevation data from other sources, such as digitization and attribution of contour lines from topoquad separates in order to attain required level of detail.

b. Location for the Theme Data to be Maintained

Ideally, the data would be extracted from USGS or NCGC, processed, then stored at the Service Center using the data.

c. Maintenance and Updating Procedures Overview

To be determined.