DATA STANDARDS AND DELIVERY REQUIREMENTS

Last Update: January 25, 2002

A) General Guidelines

1) All reports and documents shall be delivered to GCMRC in electronic format and paper copy in duplicate. The contract number and trip ID, if applicable, must be placed upon the first page of the report. Data deliverables shall contain a contract number and description of deliverable on a cover sheet included with the data. The description of the data shall include the status and type of the data/report, i.e. draft, final, trip report and a description of the contract/agreement deliverable being satisfied by the report/data.
2) All reports and data shall be delivered to the records officer at the following address:
   ATTN: Record Officer – MS5000
   Grand Canyon Monitoring and Research Center
   2255 N. Gemini Drive
   Flagstaff, AZ 86001
3) Raw and processed data shall be delivered in electronic format on CDROM or DVD.
4) Geographic Information System (GIS) data shall conform with National Mapping and National Spatial Data Infrastructure (NSDI - http://www.fgdc.gov/nsdi/nsdi.html) standards where standards have been established.
5) Physical and biological data shall conform to National Biological Information Infrastructure (NBII) standards where standards have been established. Content standards can be found at: http://www.nbii.gov/standards/index.html
6) Each data set shall be accompanied by metadata conforming to the Federal Geographic Data Committee (FGDC) metadata standards where established. Content standards can be found at: http://www.fgdc.gov/metadata/contstan.html
7) All database measurements shall be supplied in Standard International units.
8) All data shall be year 2000 compliant.
9) All raw and processed data, field notes, metadata, samples, and sample collection forms generated or collected through scientific activities are the property of the U. S. Government and will be made available to the public as specified in the Release of Data section (G-4) of this document. All materials shall be delivered to the GCMRC and the National Park Service (NPS) in accordance with research and collecting permits, upon completion of the agreement.
10) All data received will require a 45 day evaluation period for the GCMRC to verify its completeness related to the contract specifications and GCMRC data standards.

B) Discovery of data collection protocols, quality control procedures, and quality assurance results

Each data collection activity requires a documented protocol that includes appropriate quality control procedures and quality assurance checks. Data collection protocols, quality control procedures, and quality assurance results must accompany data sets upon delivery as part of the metadata requirement.

C) Confidential/restricted data

Availability and archiving of confidential, restricted, and/or sensitive data will be addressed with individual agreements.

D) Ownership of data

All raw and processed data, field notes, samples, and sample collection forms generated or collected under this agreement are the property of the U. S. Government and are to be delivered to the GCMRC, or the National Park Service (NPS) in accordance with research and collecting permits, upon completion of the agreement.

E) Timeliness of data delivery

Data designated as research data shall be delivered to GCMRC at the completion of the agreement. Data designated as monitoring data shall be delivered to GCMRC within the time frames specified in the agreement. Data delivery of monitoring data shall include raw and processed data, original field notes, samples, and sample collection forms at the discretion of the GCMRC.

F) Data delivery requirements

1) GIS data shall be delivered electronically using ARC/INFO export format (e00) for coverages and grids with accompanying FGDC compliant metadata. For more information on metadata see the metadata section (Section F, Item 11).

   Coverages and Grids must be delivered with the following map coordinate system:

Projection	STATEPLANE
Fipszone	202 (Arizona Central)
Datum	NAD83
Units	METERS
Spheroid	GRS1980

   The vertical datum is NAVD 88.

   When vertical position (elevation or z) is required to be reported with a dataset, all RAW data deliverables shall contain a data item with the ellipsoid height as well one with GEOID elevations. All data shall be delivered with elevations derived using the most current GEOID (e.g. GEOID99). Derived products with elevation values only need to report the GEOID elevation value. It is the responsibility of the contractor to clarify which deliverables require ellipsoid heights and which do not.

   Maps shall be delivered in Arc/Info map composition format (Arcplot) with associated, thoroughly documented Arc Macro Language (AML) included.

2) All data shall be delivered in double precision, i.e. 15 significant digits. Where multiple coverages of point data are to be delivered for an area, the geographic coordinates of any particular data point in all the deliverables shall have the same geographic coordinate values to 15 significant digits.
3) Tabular data shall be delivered electronically using comma delimited ASCII files. Null values will be represented by two commas with no space or information between them, e.g.

“,,”. Data shall be delivered with accompanying FGDC compliant metadata where defined and applicable. File header information must contain the number of records, and field descriptors identifying column names, data types (i.e. date, integer, floating, etc.), field widths, decimal places and units.

4) Written reports and documents shall be delivered in hard copy form and electronically in Microsoft Word 7.0 or later format and Portable Document Format (PDF). All text, charts, pictures, graphics, and tables must be integrated into a single file. All electronic reports shall be compliant with Section 508 of the Rehabilitation Act (accessible to people with vision disabilities).
5) Trip reports, where applicable, shall be delivered in hard copy form and electronically in MS Word 7.0 or later format, within two weeks of trip completion. Trip reports shall describe successful as well as unsuccessful data collection efforts, and must contain, but are not be limited to, the following information:
    a) Project title.
    b) GCMRC Contract/Agreement Number, and submittal number if applicable.
    c) Authors: name and affiliations of investigators.
    d) Submittal date.
    e) GCMRC Trip_ID(s), if applicable.
    f) Date(s) of fieldwork.
    g) Description of field methods.
    h) Description of data files accompanying submittal.
    i) Description of each column within each accompanying data file, including column name, position, units and data type.
    j) Number of records in each data file.
    k) Geographic coordinates and datum (and/or river mile system) used in locating sample information.
    l) Any other information about the data set that will lend to clarity of understanding.

6) All data requires a spatial locator in Stateplane coordinate system. Accuracy requirements for the spatial positioning will be specified by GCMRC on a project by project basis.
7) All compression of files will occur using the GZIP utility. If the GZIP utility is used, it must be copied to each CDROM with GZIPPED compressed files on it.
8) Data will be delivered using one of these file naming conventions (the GCMRC will direct which file naming convention is appropriate to follow on a case-by-case basis):

<u>File naming convention for data delivered by flightlines</u>

a) Flightline/exposure or Flightline/type of data
b) Flightlines shall start at 1 and continue downstream in numeric order.
c) Flightlines and Exposure numbers shall be four digits in all file names.

Examples:

a) fl0001exp0001.tif
b) fl1432exp2001.tif
c) fl0023_pts

<u>All other data shall be delivered by USGS quarterquads</u>

The GCMRC ftp server contains an Arc/Info export file of a quarterquads coverage (ftp.gcmrc.gov/data/data_standards/gcmrcquads.e00). Use this FILENAME attribute to develop the export filenames. The "FILENAME" attribute contains the USGS quadcode,

i.e. 35113G3 with a prefix of "SE, SW, NE, NW" for the appropriate quarterquad. An additional 4 characters are available to specify the type of data. For example, a contour file within the Northwest Diamond Peak quarterquad would be named, "NW35113G3_con.e00"

9) CDROM/DVD media delivery specifications:
   a) No paper adhesive labels be fixed on the face of the media. If contractor does not have a media writer that prints directly onto the face of the media, the label information will be merely inserted in the jewel case.
   b) Imprinting on media face must be done to allow distinct identification of the CD (in case it is separated from its jewel case. This may mean that minimal or no contractor logo information is printed on the face.
   c) The back cover of the jewel case will contain the contents of the media and the side of that back cover will uniquely identify the media by the contract number, trip id, date, flight line, picture sequence, and possibly data type.
   d) Duplicate copies of all media are required at the time of delivery.
10) Imagery NODATA Values
   a) 8-bit data – Store NODATA as 0.
   b) 12-bit or higher data – Store NODATA as largest negative value possible.
11) Metadata Requirements
   a) Each file delivered to the GCMRC must have FGDC compliant metadata including, but not limited to, ESRI export format files (.e00), imagery (tif), compressed imagery (.sid), and tabular data (.txt).
   b) All metadata shall be developed with the metadata tool (ArcCatalog) in Desktop Arc/Info. Metadata files shall be delivered with coverages in the same e00 file. In addition to the copy within the e00 file, a XML format copy of the metadata with the same root file name as the file it pertains to must accompany each deliverable. Metadata must be delivered on the same CDROM as the file it pertains to.
   c) Raw Imagery metadata shall contain the exterior orientation and pointing parameters that includes, but is not necessary limited to:

      camera type
      Calibrated focal length
      Camera position and orientation from airborne GPS and IMU
      X Y Z (MSL) Omega Phi Kappa
      Time and day of the exposure:
      Approximate photograph corner coordinates as
      projected from the airborne GPS photo center
      coordinate data collected simultaneously with the
      photography:

      Exterior orientation and camera pointing parameter information shall be stored in the XML format metadata file under the Entity and Attribute Overview section (see example in Appendix B).
   d) Metadata shall contain all the components, but is not limited to, those items contained in the metadata examples in Appendix A (Vector Metadata Examples) and Appendix B (Raster Metadata Example). Metadata shall be formatted according to the examples provided in the

Appendix. Additional information, beyond those items demonstrated in the metadata examples, may be necessary to be included in the metadata to ensure its completeness. Additional required metadata components for a particular deliverable will be defined at the discretion of the GCMRC.

12) Raster Data Format

a) All raster data shall be delivered in Tagged Image File Format (TIFF) file format version 5.0. Refer to Aldus/Microsoft Technical Memorandum dated 8/8/88 for details regarding this specification.

b) TIFF images that contain georeferencing information must store that information in header tags defined by the GeoTIFF standard. The Baseline GeoTIFF tags must contain at a minimum the following information:

ModelTiePointTag: Gives a pixel coordinate and corresponding map coordinate. It is similar to lines 5 and 6 of the world file.

ModelPixelScaleTag: Gives the dimensions of a pixel in map units. The x and y scale may be different. This is similar to lines 1 and 4 of the world file.

ModelTransformationTag: This is a more comprehensive tag that contains all the information in the other two, and more. It specifies a mathematical transformation from pixel space to map space.

c) In addition to the above internal header GeoTIFF tags, an external TIFF World File (TFW) must be generated for each TIFF file that contains georeferenced information. This requirement is in addition to generating the internal GeoTIFF tags and is required to support legacy softwares that cannot read GeoTIFF tags.

d) All TIFF files (both GeoTIFF and non-georeferenced TIFFs) must be readable with no additional processing in the following softwares:
   1. ENVI (v 3.4)
   2. ERDAS (c 8.5)
   3. ESRI (v. 7.0.2 workstation and v. 8.1 desktop and workstation)

e) GZIP lossless compression allowed. No LZW compression or lossy compression is permitted.

G) Management of Data

1) Definition. In this clause "data" is defined the same as in the clause entitled "Rights in Data-Special Works."
2) Policy. The general policy is that the maximum amount and type of data obtained from work under this agreement is to be released. However, data that pertains to sensitive, restricted, or confidential areas will be withheld and protected under the terms of the Rights in Data clause.
3) Releasable data. The following general classes of data obtained from work on this agreement are considered releasable:
    3.1 metadata of all contracted work
    3.2 monitoring data for non-sensitive species or resources (e.g., vegetation, water quality, sediment)
    3.3 monitoring data for sensitive species or cultural resources
    3.4 data associated with research in support of monitoring

    The level of availability of releasable data is dependent on the proprietary level, or protection, assigned to each type of data. The following data have a higher level of protection associated with them:
        a. Endangered species locations and monitoring data
        b. Cultural artifact locations and monitoring data
        c. Research data collected in support of monitoring
4) Release procedure. The process for releasing data will be in accordance with the Rights in Data clause cited above. While data are to be delivered to GCMRC in accordance with agreements, the availability of the data for use by others is dependent on the class of data and the proprietary level of the data. The following provides a time line and level of availability for release for each class of data:
    4.1 **metadata of all contracted work** – within 1 month of completion of project or by first delivery of monitoring data – general release/Internet access.
    4.2 **monitoring data for non-sensitive species or resources** - within 2 months of field collection – general release/Internet access.
    4.3 **monitoring data for sensitive species or resources** – within 2 months of field collection – available to appropriate management agencies (FWS, GCMRC, BOR). Available for general release by request submitted to GCMRC and approval of contact identified in metadata information. – released via disk or agreed to method.
    4.4 **Data associated with research in support of monitoring** – by November 1st of the year following the data collection – released by request submitted to GCMRC and approval of contact identified in metadata information - released via disk or agreed to method.

Appendix A. Vector Metadata Examples.

These examples are provided as examples of the minimum required metadata components that should be included in any vector data product that is supplied to the GCMRC. Additional metadata components may be necessary depending upon the delivered product and will be determined by the GCMRC.

Vector Metadata Example # 1:

s5geolgeom

Metadata:

Identification_Information:
Citation:
Citation_Information:
Originator:
Bureau of Reclamation Remote Sensing & Geographic Information Group
Publication_Date: Unpublished Material
Title: s5geolgeom
Geospatial_Data_Presentation_Form: map
Publication_Information:
Publication_Place: none
Publisher: none
Online_Linkage:
<http://www.gcmrc.gov> <http://www.usbr.gov/gces/gces.html> <http://www.horizonsinc.com> <http://www.rsgis.do.usbr.gov>
Larger_Work_Citation:
Citation_Information:
Originator: Bureau of Reclamation Applied Sciences Branch
Publication_Date: 199309
Title:
Developing a Geographic Information System for Resource Monitoring on the Colorado River in the Grand Canyon
Geospatial_Data_Presentation_Form: report
Series_Information:
Series_Name: R Reports
Issue_Identification: No. R-93-20
Publication_Information:
Publication_Place: Denver, Colorado

Publisher:
Bureau of Reclamation Remote Sensing & Geographic Information Group
Description:
Abstract:
Polygon data defining talus slopes and alluvial fans along the Colorado River were derived from color infrared aerial photographs (1:4800 enlarged to 1:2400) taken June 3, 1990 and delineated on a ortho-photo basemap of June 3, 1990. Area is Grand Canyon GIS Site 5 (River Mile 60-72)
Purpose: Long term monitoring
Time_Period_of_Content:
Time_Period_Information:
Single_Date/Time:
Calendar_Date: 199309
Currentness_Reference: publication date
Status:
Progress: Complete
Maintenance_and_Update_Frequency: None planned
Spatial_Domain:
Bounding_Coordinates:
West_Bounding_Coordinate: -111.879230
East_Bounding_Coordinate: -111.781120
North_Bounding_Coordinate: 36.215682
South_Bounding_Coordinate: 36.083722
Keywords:
Theme:
Theme_Keyword_Thesaurus: none
Theme_Keyword: cartography
Theme_Keyword: aerial surveys
Theme_Keyword: mapping
Theme_Keyword: photogrammetry
Theme_Keyword: surveying
Theme_Keyword: topographic mapping
Theme_Keyword: geographic information systems
Theme_Keyword: remote sensing
Theme_Keyword: global positioning system
Theme_Keyword: vegetation
Theme_Keyword: synecology
Theme_Keyword: geology
Theme_Keyword: geomorphology
Theme_Keyword: talus
Theme_Keyword: alluvium
Theme_Keyword: alluvial fan
Place:
Place_Keyword_Thesaurus: none
Place_Keyword: Grand Canyon
Place_Keyword: Colorado River
Place_Keyword: Arizona
Temporal:
Temporal_Keyword_Thesaurus: none
Temporal_Keyword: 1990
Temporal_Keyword: june
Access_Constraints: Contact GCMRC <http://www.gcmrc.gov>
Use_Constraints: Contact GCMRC <http://www.gcmrc.gov>
Point_of_Contact:
Contact_Information:
Contact_Person_Primary:
Contact_Person: Steve Mietz

Contact_Organization: Grand Canyon Monitoring and Research Center
Contact_Position: GIS Coordinator
Contact_Address:
Address_Type: mailing and physical address
Address:
2255 N Gemini Dr Room 487
City: Flagstaff
State_or_Province: AZ
Postal_Code: 86001
Country: USA
Contact_Voice_Telephone: (520) 556-7050
Contact_Facsimile_Telephone: (520) 556-7368
Contact_Electronic_Mail_Address: smietz@flagmail.wr.usgs.gov
Hours_of_Service: 8-4 M-F
Contact_Instructions: call, e-mail, or write
Data_Set_Credit: Patrick Wright
Native_Data_Set_Environment: Arc/Info NT Windows

Data_Quality_Information:
Attribute_Accuracy:
Attribute_Accuracy_Report: classified on-site
Quantitative_Attribute_Accuracy_Assessment:
Attribute_Accuracy_Value: 100
Attribute_Accuracy_Explanation:
percent fully field checked
Logical_Consistency_Report:
topology created nodes where lines cross
Completeness_Report: complete
Positional_Accuracy:
Horizontal_Positional_Accuracy:
Horizontal_Positional_Accuracy_Report:
meets national map accuracy standards: For maps on publication scales larger than 1:20,000, not more than 10 percent of the points tested shall be in error by more than 1/30 inch, measured on the publication scale.
Quantitative_Horizontal_Positional_Accuracy_Assessment:
Horizontal_Positional_Accuracy_Value: 2
Horizontal_Positional_Accuracy_Explanation:
meters estimated typical maximum error based on basemap accuracy
Vertical_Positional_Accuracy:
Vertical_Positional_Accuracy_Report: n/a
Quantitative_Vertical_Positional_Accuracy_Assessment:
Vertical_Positional_Accuracy_Value: 0
Vertical_Positional_Accuracy_Explanation: n/a
Lineage:
Source_Information:
Source_Citation:
Citation_Information:
Originator:
Horizons, Inc. 3600 Jet Dr P.O. Box 3134 Rapid City, SD 57709-3134
Publication_Date: Unpublished Material
Title: Horizons 0-5037
Geospatial_Data_Presentation_Form: map
Other_Citation_Details: Contract No. 8-CS-40-0517B-D008
Online_Linkage: <http://www.horizonsinc.com>
Source_Scale_Denominator: 2400
Type_of_Source_Media: ortho-rectified aerial photographs
Source_Time_Period_of_Content:

Time_Period_Information:
Single_Date/Time:
Calendar_Date: 19900603
Source_Currentness_Reference: ground condition
Source_Citation_Abbreviation: Horizons
Source_Contribution: ortho-photo basemap with coordinate grid
Process_Step:
Process_Description:
These data were drafted onto clear mylar on top of the orthophotobasemap. The data were interpreted by looking at the color infrared 1:2400 photo- graphs, mentally noting the various feature types to be interpreted, finding the same features on the orthophotobasemap, and drawing the points or lines depicting the features. Tic marks from the orthophotobasemaps were drawn on the clear mylar. These clear mylars were then scanned and entered into the GIS (Arc/Info). The scanned data were converted from raster to vector, edited, and transformed from scanner inches to Arizona Central State Plane meters.
Process_Date: 1990
Process_Contact:
Contact_Information:
Contact_Person_Primary:
Contact_Person: Patrick Wright
Contact_Organization:
Bureau of Reclamation Remote Sensing Geographic Information Group
Contact_Position: contract supervisor
Contact_Address:
Address_Type: mailing address
Address:
D-8260 PO Box 25007
City: Denver
State_or_Province: Colorado
Postal_Code: 80225
Contact_Voice_Telephone: (303) 445-2288
Contact_Facsimile_Telephone: (303) 445-6337
Contact_Electronic_Mail_Address: pwright@do.usbr.gov
Hours_of_Service: 8-4 M-F
Contact_Instructions: call/e-mail/write
Cloud_Cover: 0

Spatial_Data_Organization_Information:
Direct_Spatial_Reference_Method: Vector
Point_and_Vector_Object_Information:
SDTS_Terms_Description:
SDTS_Point_and_Vector_Object_Type: Complete chain
Point_and_Vector_Object_Count: 10327
SDTS_Terms_Description:
SDTS_Point_and_Vector_Object_Type: Entity point
Point_and_Vector_Object_Count: 228
SDTS_Terms_Description:
SDTS_Point_and_Vector_Object_Type: GT-polygon composed of chains
Point_and_Vector_Object_Count: 4528
SDTS_Terms_Description:
SDTS_Point_and_Vector_Object_Type: Point
Point_and_Vector_Object_Count: 487

Spatial_Reference_Information:
Horizontal_Coordinate_System_Definition:
Planar:
Grid_Coordinate_System:

Grid_Coordinate_System_Name: State Plane Coordinate System 1983
State_Plane_Coordinate_System:
SPCS_Zone_Identifier: 202
Transverse_Mercator:
Scale_Factor_at_Central_Meridian: 0.999900
Longitude_of_Central_Meridian: -111.916667
Latitude_of_Projection_Origin: 31.000000
False_Easting: 213360.000000
False_Northing: 0.000000
Planar_Coordinate_Information:
Planar_Coordinate_Encoding_Method: coordinate pair
Coordinate_Representation:
Abscissa_Resolution: 0.000016
Ordinate_Resolution: 0.000016
Planar_Distance_Units: meters
Geodetic_Model:
Horizontal_Datum_Name: North American Datum of 1983
Ellipsoid_Name: Geodetic Reference System 80
Semi-major_Axis: 6378137.000000
Denominator_of_Flattening_Ratio: 298.257222

Entity_and_Attribute_Information:
Detailed_Description:
Entity_Type:
Entity_Type_Label: s5geolgeom.aat
Entity_Type_Definition: arc attribute table
Entity_Type_Definition_Source: project
Attribute:
Attribute_Label: FID
Attribute_Definition: sequential record number
Attribute_Definition_Source: software
Attribute_Domain_Values:
Enumerated_Domain:
Enumerated_Domain_Value: Positive integers
Enumerated_Domain_Value_Definition: record #
Enumerated_Domain_Value_Definition_Source: software
Unrepresentable_Domain:
Sequential unique whole numbers that are automatically generated.
Attribute:
Attribute_Label: SHAPE
Attribute_Definition: geometric shape of feature
Attribute_Definition_Source: internal to arc/info
Attribute_Domain_Values:
Enumerated_Domain:
Enumerated_Domain_Value: 'point', 'polygon', 'polyline'
Enumerated_Domain_Value_Definition: shape of feature
Enumerated_Domain_Value_Definition_Source: arc/info internal
Unrepresentable_Domain: Coordinates defining the features.
Attribute:
Attribute_Label: FNODE#
Attribute_Definition: from node number
Attribute_Definition_Source: internal to arc/info
Attribute_Domain_Values:
Enumerated_Domain:
Enumerated_Domain_Value: Positive integers
Enumerated_Domain_Value_Definition: from node number

Enumerated_Domain_Value_Definition_Source: internal to arc/info
Unrepresentable_Domain: Whole numbers that are automatically generated.
Attribute:
Attribute_Label: TNODE#
Attribute_Definition: to node number
Attribute_Definition_Source: internal to arc/info
Attribute_Domain_Values:
Enumerated_Domain:
Enumerated_Domain_Value: Positive integers
Enumerated_Domain_Value_Definition: to node number
Enumerated_Domain_Value_Definition_Source: internal to arc/info
Unrepresentable_Domain: Whole numbers that are automatically generated.
Attribute:
Attribute_Label: LPOLY#
Attribute_Definition: left side polygon number
Attribute_Definition_Source: internal to arc/info
Attribute_Domain_Values:
Enumerated_Domain:
Enumerated_Domain_Value: Positive integers
Enumerated_Domain_Value_Definition: left polygon number
Enumerated_Domain_Value_Definition_Source: internal to arc/info
Unrepresentable_Domain: Whole numbers that are automatically generated.
Attribute:
Attribute_Label: RPOLY#
Attribute_Definition: right polygon number
Attribute_Definition_Source: internal to arc/info
Attribute_Domain_Values:
Enumerated_Domain:
Enumerated_Domain_Value: Positive integers
Enumerated_Domain_Value_Definition: right polygon number
Enumerated_Domain_Value_Definition_Source: internal to arc/info
Unrepresentable_Domain: Whole numbers that are automatically generated.
Attribute:
Attribute_Label: LENGTH
Attribute_Definition: length of arc in meters
Attribute_Definition_Source: internal to arc/info
Attribute_Domain_Values:
Range_Domain:
Range_Domain_Minimum: 0
Range_Domain_Maximum: 99999.999
Attribute_Units_of_Measure: meters
Attribute_Measurement_Resolution: 0.001
Unrepresentable_Domain: Positive real numbers that are automatically generated.
Attribute:
Attribute_Label: S5GEOLGEOM#
Attribute_Definition: internal arc id number
Attribute_Definition_Source: internal to arc/info
Attribute_Domain_Values:
Enumerated_Domain:
Enumerated_Domain_Value: non-negative integers
Enumerated_Domain_Value_Definition: internal arc id number
Enumerated_Domain_Value_Definition_Source: internal to arc/info
Unrepresentable_Domain:
Sequential unique whole numbers that are automatically generated.
Attribute:
Attribute_Label: S5GEOLGEOM-ID

Attribute_Definition: user arc id number
Attribute_Definition_Source: arbitrary from user
Attribute_Domain_Values:
Enumerated_Domain:
Enumerated_Domain_Value: Positive integers
Enumerated_Domain_Value_Definition: user arc id number
Enumerated_Domain_Value_Definition_Source: project
Attribute:
Attribute_Label: $ID
Attribute_Definition: alternate user arc id
Attribute_Definition_Source: arbitrary from user
Attribute_Domain_Values:
Enumerated_Domain:
Enumerated_Domain_Value: Positive integers
Enumerated_Domain_Value_Definition: user arc id number
Enumerated_Domain_Value_Definition_Source: project
Attribute:
Attribute_Label: $FROMNODE
Attribute_Definition: alternate from node number
Attribute_Definition_Source: internal to arc/info
Attribute_Domain_Values:
Enumerated_Domain:
Enumerated_Domain_Value: Positive integers
Enumerated_Domain_Value_Definition: from node number
Enumerated_Domain_Value_Definition_Source: internal to arc/info
Attribute:
Attribute_Label: $TONODE
Attribute_Definition: alternate to node id number
Attribute_Definition_Source: internal to arc/info
Attribute_Domain_Values:
Enumerated_Domain:
Enumerated_Domain_Value: Positive integers
Enumerated_Domain_Value_Definition: to node number
Enumerated_Domain_Value_Definition_Source: internal to arc/info
Attribute:
Attribute_Label: $LEFTPOLYGON
Attribute_Definition: alternate left polygon id number
Attribute_Definition_Source: internal to arc/info
Attribute_Domain_Values:
Enumerated_Domain:
Enumerated_Domain_Value: Positive integers
Enumerated_Domain_Value_Definition: left polygon number
Enumerated_Domain_Value_Definition_Source: internal to arc/info
Attribute:
Attribute_Label: $RIGHTPOLYGON
Attribute_Definition: alternate right polygon id number
Attribute_Definition_Source: internal to arc/info
Attribute_Domain_Values:
Enumerated_Domain:
Enumerated_Domain_Value: Positive integers
Enumerated_Domain_Value_Definition: right polygon number
Enumerated_Domain_Value_Definition_Source: internal to arc/info
Detailed_Description:
Entity_Type:
Entity_Type_Label: s5geolgeom.pat
Entity_Type_Definition: polygon features

Entity_Type_Definition_Source: project
Attribute:
Attribute_Label: FID
Attribute_Definition: sequential record number
Attribute_Definition_Source: software
Attribute_Domain_Values:
Enumerated_Domain:
Enumerated_Domain_Value: Positive integers
Enumerated_Domain_Value_Definition: record #
Enumerated_Domain_Value_Definition_Source: software
Unrepresentable_Domain:
Sequential unique whole numbers that are automatically generated.
Attribute:
Attribute_Label: SHAPE
Attribute_Definition: geometric shape of feature
Attribute_Definition_Source: internal to arc/info
Attribute_Domain_Values:
Enumerated_Domain:
Enumerated_Domain_Value: 'point', 'polygon', 'polyline'
Enumerated_Domain_Value_Definition: shape of feature
Enumerated_Domain_Value_Definition_Source: arc/info internal
Unrepresentable_Domain: Coordinates defining the features.
Attribute:
Attribute_Label: AREA
Attribute_Definition: area of polygon in coverage units (m)
Attribute_Definition_Source: calculated by arc/info
Attribute_Domain_Values:
Range_Domain:
Range_Domain_Minimum: 0
Range_Domain_Maximum: 999999.999
Attribute_Units_of_Measure: meters
Attribute_Measurement_Resolution: 0.001
Unrepresentable_Domain: Positive real numbers that are automatically generated.
Attribute:
Attribute_Label: PERIMETER
Attribute_Definition: perimeter distance of polygon
Attribute_Definition_Source: calculated by arc/info
Attribute_Domain_Values:
Range_Domain:
Range_Domain_Minimum: 0
Range_Domain_Maximum: 999999.999
Attribute_Units_of_Measure: meters
Attribute_Measurement_Resolution: 0.001
Unrepresentable_Domain: Positive real numbers that are automatically generated.
Attribute:
Attribute_Label: S5GEOLGEOM#
Attribute_Definition: internal polygon id number
Attribute_Definition_Source: internal to arc/info
Attribute_Domain_Values:
Enumerated_Domain:
Enumerated_Domain_Value: non-negative integers
Enumerated_Domain_Value_Definition: internal polygon id number
Enumerated_Domain_Value_Definition_Source: internal to arc/info
Unrepresentable_Domain:
Sequential unique whole numbers that are automatically generated.
Attribute:

Attribute_Label: S5GEOLGEOM-ID
Attribute_Definition: user polygon id number
Attribute_Definition_Source: arbitrary from user
Attribute_Domain_Values:
Enumerated_Domain:
Enumerated_Domain_Value: Positive integers
Enumerated_Domain_Value_Definition: user polygon id number
Enumerated_Domain_Value_Definition_Source: arbitrary
Attribute:
Attribute_Label: CLASS
Attribute_Definition: sediment type
Attribute_Definition_Source: project
Attribute_Domain_Values:
Enumerated_Domain:
Enumerated_Domain_Value: 06
Enumerated_Domain_Value_Definition: travertine ledge
Enumerated_Domain_Value_Definition_Source: project
Enumerated_Domain:
Enumerated_Domain_Value: 07
Enumerated_Domain_Value_Definition: rock ledge
Enumerated_Domain_Value_Definition_Source: project
Enumerated_Domain:
Enumerated_Domain_Value: 08
Enumerated_Domain_Value_Definition: alluvial fan
Enumerated_Domain_Value_Definition_Source: project
Enumerated_Domain:
Enumerated_Domain_Value: 09
Enumerated_Domain_Value_Definition: rock face
Enumerated_Domain_Value_Definition_Source: project
Enumerated_Domain:
Enumerated_Domain_Value: 10
Enumerated_Domain_Value_Definition: talus slope
Enumerated_Domain_Value_Definition_Source: project
Enumerated_Domain:
Enumerated_Domain_Value: 11C
Enumerated_Domain_Value_Definition: camping beach
Enumerated_Domain_Value_Definition_Source: project
Enumerated_Domain:
Enumerated_Domain_Value: 14
Enumerated_Domain_Value_Definition: cobble bars
Enumerated_Domain_Value_Definition_Source: project
Enumerated_Domain:
Enumerated_Domain_Value: 15
Enumerated_Domain_Value_Definition: boulders
Enumerated_Domain_Value_Definition_Source: project
Enumerated_Domain:
Enumerated_Domain_Value: 17
Enumerated_Domain_Value_Definition: sand bars
Enumerated_Domain_Value_Definition_Source: project
Enumerated_Domain:
Enumerated_Domain_Value: 18
Enumerated_Domain_Value_Definition: contours
Enumerated_Domain_Value_Definition_Source: project
Enumerated_Domain:
Enumerated_Domain_Value: 19
Enumerated_Domain_Value_Definition: river miles

Enumerated_Domain_Value_Definition_Source: project
Beginning_Date_of_Attribute_Values: 19900602
Ending_Date_of_Attribute_Values: 19900604
Attribute:
Attribute_Label: SUBALUV
Attribute_Definition: alluvial fan
Attribute_Definition_Source: project
Attribute_Domain_Values:
Enumerated_Domain:
Enumerated_Domain_Value: A
Enumerated_Domain_Value_Definition: Alluvial fan
Enumerated_Domain_Value_Definition_Source: project
Attribute:
Attribute_Label: TALUS
Attribute_Definition: talus slope
Attribute_Definition_Source: project
Attribute_Domain_Values:
Enumerated_Domain:
Enumerated_Domain_Value: T
Enumerated_Domain_Value_Definition: talus slope
Enumerated_Domain_Value_Definition_Source: project
Attribute:
Attribute_Label: ROCKLEDGE
Attribute:
Attribute_Label: CD

Distribution_Information:
Distributor:
Contact_Information:
Contact_Person_Primary:
Contact_Person: Steve Mietz
Contact_Organization: Grand Canyon Monitoring and Research Center
Contact_Position: GIS Coordinator
Contact_Address:
Address_Type: mailing and physical address
Address:
2255 N Gemini Dr Room 487
City: Flagstaff
State_or_Province: Arizona
Postal_Code: 86001
Contact_Voice_Telephone: (520) 556-7050
Contact_Facsimile_Telephone: (520) 556-7368
Contact_Electronic_Mail_Address: smietz@flagmail.wr.usgs.gov
Hours_of_Service: 8-4 M-F
Contact_Instructions: e-mail, call, or write
Resource_Description: s5geolgeom (GCES Site 5 geology data)
Distribution_Liability:
GCMRC is not responsible and shall not be liable to the user for damages of any kind arising out of the use of data or information provided by GCMRC, including the installation of the data or information, its use, or the results obtained from its use. ANY DATA OR INFORMATION PROVIDED BY GCMRC IS PROVIDED "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.
Standard_Order_Process:
Digital_Form:
Digital_Transfer_Information:

Format_Name: Arc/Info Export
Format_Version_Date: 2000
Format_Specification: arc info export
Format_Information_Content: arc/info coverage
File_Decompression_Technique: No compression applied
Transfer_Size: 5.636
Digital_Transfer_Option:
Online_Option:
Computer_Contact_Information:
Network_Address:
Network_Resource_Name: <ftp://ftp.gcmrc.gov/data>
Access_Instructions: ftp
Online_Computer_and_Operating_System: windows
Fees: none
Ordering_Instructions: n/a
Turnaround: n/a
Custom_Order_Process: contact GCMRC
Technical_Prerequisites: arc/info or other GIS which accepts arc/info export files
Available_Time_Period:
Time_Period_Information:
Single_Date/Time:
Calendar_Date: 19900603

Metadata_Reference_Information:
Metadata_Date: 200007
Metadata_Review_Date: 200007
Metadata_Future_Review_Date: 200007
Metadata_Contact:
Contact_Information:
Contact_Person_Primary:
Contact_Person: Patrick Wright
Contact_Organization:
Bureau of Reclamation Remote Sensing Geographic Information Group
Contact_Organization_Primary:
Contact_Organization:
The organization responsible for the metadata information. REQUIRED.
Contact_Person: The person responsible for the metadata information. REQUIRED.
Contact_Position: Contract Supervisor
Contact_Address:
Address_Type: mailing and physical address
Address:
D-8260 PO Box 25007
City: Denver
State_or_Province: Colorado
Postal_Code: 80225-0007
Contact_Voice_Telephone: (303) 445-2288
Contact_Facsimile_Telephone: (303) 445-6337
Contact_Electronic_Mail_Address: pwright@do.usbr.gov
Hours_of_Service: 8-4 MF
Contact_Instructions: call, write or e-mail
Metadata_Standard_Name: FGDC Content Standards for Digital Geospatial Metadata
Metadata_Standard_Version: FGDC-STD-001-1998
Metadata_Time_Convention: local time
Metadata_Access_Constraints: none
Metadata_Use_Constraints: none
Metadata_Security_Information:

Metadata_Security_Classification_System: none
Metadata_Security_Classification: Unclassified
Metadata_Security_Handling_Description: none
Metadata_Extensions:
Online_Linkage: <http://www.esri.com/metadata/esriprof80.html>
Profile_Name: ESRI Metadata Profile
Metadata_Extensions:
Online_Linkage: <http://www.esri.com/metadata/esriprof80.html>
Profile_Name: ESRI Metadata Profile

Vector Metadata Example # 2:

ne35113f4_con

Metadata:

Identification_Information:
Citation:
Citation_Information:
Originator: EarthData International of New Mexico
Publication_Date: March 23, 2001
Title: ne35113f4_con
Geospatial_Data_Presentation_Form: vector digital data
Description:
Abstract:
Contours at one-meter intervals from TIN surface tiled by USGS quarterquad. TIN surface represents last-return LIDAR data after noise filtering and feature edit. Original LIDAR data collected at a nominal point spacing of 4 meters. The flow of the Colorado River during the LIDAR acquisition was 8000 C.F.S.
Purpose: Cartographic representation of topography
Time_Period_of_Content:
Time_Period_Information:
Range_of_Dates/Times:
Beginning_Date: March 27, 2000
Ending_Date: April 7, 2000
Currentness_Reference: ground condition
Status:
Progress: Complete
Maintenance_and_Update_Frequency: None planned
Spatial_Domain:

Bounding_Coordinates:
West_Bounding_Coordinate: -113.438457
East_Bounding_Coordinate: -113.377612
North_Bounding_Coordinate: 35.750759
South_Bounding_Coordinate: 35.743735
Keywords:
Theme:
Theme_Keyword_Thesaurus: None
Theme_Keyword: LIDAR
Theme_Keyword: Contours
Theme_Keyword: Topography
Place:
Place_Keyword: Grand Canyon
Place_Keyword: Glen Canyon Dam
Place_Keyword: Colorado River
Place_Keyword: Arizona
Temporal:
Temporal_Keyword: 2000
Temporal_Keyword: March
Access_Constraints: None
Use_Constraints:
LIDAR data was final edited in the area of base of cliff to base of cliff at a scale of 1:600. The data that falls in the base of cliff to base of cliff area are therefore recommended only for use at a 1:600 scale or smaller. LIDAR data that falls outside of the base of cliff to base of cliff area of the project have not been processed through a final data edit. These data are not recommended for use at scales larger than 1:2400. Areas that are enclosed by a polygon from the 'reducedacc' (reduced accuracy) polygon coverage specifies areas of minimal LIDAR data points. Such areas have a zero warranty for vertical accuracy.
Point_of_Contact:
Contact_Information:
Contact_Person_Primary:
Contact_Person: Steve Mietz
Contact_Organization: Grand Canyon Monitoring and Research Center
Contact_Position: GIS Coordinator
Contact_Voice_Telephone: 520-556-7050
Contact_Facsimile_Telephone: 520-556-7368
Contact_Electronic_Mail_Address: smietz@usgs.gov
Native_Data_Set_Environment:
Windows NT Version 5.0 (Build 2195) Service Pack 1; ESRI ArcInfo 8.1.0.415

Data_Quality_Information:
Attribute_Accuracy:
Attribute_Accuracy_Report:
Vectors meet National Map Accuracy Standards for one-meter contour interval. Original TIN created using LIDAR data collected with a design specification of 15 cm vertical accuracy (RMSE) and nominal 4 meter point spacing.
Logical_Consistency_Report:
The spatial consistency of the data have been visually verified.
Completeness_Report:
Contours generated using a smoothing tolerance of 5 degrees and a minimum closed polygon size of 100 sq. meters.
Positional_Accuracy:
Horizontal_Positional_Accuracy:
Horizontal_Positional_Accuracy_Report:
Original TIN created using LIDAR data collected with a design specification of 30 cm horizontal accuracy (RMSE)
Quantitative_Horizontal_Positional_Accuracy_Assessment:

Horizontal_Positional_Accuracy_Value: Unknown
Horizontal_Positional_Accuracy_Explanation: Horizontal accuracy determination not available
Vertical_Positional_Accuracy:
Vertical_Positional_Accuracy_Report:
Original TIN created using LIDAR data collected with a design specification of 15 cm vertical accuracy (RMSE). LIDAR data accuracy comparisons made against several sources of ground truth information shows a vertical accuracy of 3.1 to 16.7 cm RMSE.
Quantitative_Vertical_Positional_Accuracy_Assessment:
Vertical_Positional_Accuracy_Value: 15.4 cm vertical RMSE
Vertical_Positional_Accuracy_Explanation:
For LIDAR point data used to create TIN. Compared to kinematic GPS survey collected around Glen Canyon Dam.
Quantitative_Vertical_Positional_Accuracy_Assessment:
Vertical_Positional_Accuracy_Value: 3.1 to 16.7 cm RMSE
Vertical_Positional_Accuracy_Explanation:
For LIDAR point data used to create TIN. Comparison with USGS control points. The 16.7 cm RMSE value includes a high residual point USGS GP0075. The 3.1 cm RMSE values excludes point GP0075.
Lineage:
Source_Information:
Source_Citation:
Citation_Information:
Other_Citation_Details:
LIDAR and Digital Imagery Mapping of Grand Canyon, Arizona Contains details on the collection and accuracy determination of the LIDAR data
Process_Step:
Process_Description:
Noise and non-terrain points removed from LIDAR point data. Shorelines and other breaklines digitized. Point data and breaklines combined to create ESRI TIN. Contours generated from TIN in Arc/Info using first order sub-triangulation of TIN surface.
Process_Date: July, 2000
Process_Contact:
Contact_Information:
Contact_Organization_Primary:
Contact_Organization: EarthData International , New Mexico
Contact_Position: GIS Coordinator
Contact_Address:
Address_Type: mailing and physical address
Address: 5801 Osuna Rd. NE, Suite 105
City: Albuquerque
State_or_Province: New Mexico
Postal_Code: 87109
Country: United States
Contact_Voice_Telephone: 505-872-0207
Contact_Facsimile_Telephone: 505-872-0209

Spatial_Data_Organization_Information:
Direct_Spatial_Reference_Method: Vector
Point_and_Vector_Object_Information:
SDTS_Terms_Description:
SDTS_Point_and_Vector_Object_Type: Complete chain
Point_and_Vector_Object_Count: 11001
SDTS_Terms_Description:
SDTS_Point_and_Vector_Object_Type: Point
Point_and_Vector_Object_Count: 176

Spatial_Reference_Information:

Horizontal_Coordinate_System_Definition:
Planar:
Grid_Coordinate_System:
Grid_Coordinate_System_Name: State Plane Coordinate System 1983
State_Plane_Coordinate_System:
SPCS_Zone_Identifier: 202
Transverse_Mercator:
Scale_Factor_at_Central_Meridian: 0.999900
Longitude_of_Central_Meridian: -111.916667
False_Easting: 213360.000000
False_Northing: 0.000000
Planar_Coordinate_Information:
Planar_Coordinate_Encoding_Method: coordinate pair
Coordinate_Representation:
Abscissa_Resolution: 0.000001
Ordinate_Resolution: 0.000001
Planar_Distance_Units: meters
Geodetic_Model:
Horizontal_Datum_Name: North American Datum of 1983
Ellipsoid_Name: Geodetic Reference System 80
Semi-major_Axis: 6378137.000000
Denominator_of_Flattening_Ratio: 298.257222
Vertical_Coordinate_System_Definition:
Altitude_System_Definition:
Altitude_Datum_Name: National Geodetic Vertical Datum of 1929
Altitude_Resolution: 1 meter
Altitude_Distance_Units: meters
Altitude_Encoding_Method: Attribute values

Entity_and_Attribute_Information:
Detailed_Description:
Entity_Type:
Entity_Type_Label: ne35113f4_con.aat
Attribute:
Attribute_Label: FID
Attribute_Definition: Arc/Info internal ID
Attribute:
Attribute_Label: SHAPE
Attribute_Definition: Feature type
Attribute:
Attribute_Label: FNODE#
Attribute_Definition: Arc/Info internal ID
Attribute:
Attribute_Label: TNODE#
Attribute_Definition: Arc/Info internal ID
Attribute:
Attribute_Label: LPOLY#
Attribute_Definition: Arc/Info internal ID
Attribute:
Attribute_Label: RPOLY#
Attribute_Definition: Arc/Info internal ID
Attribute:
Attribute_Label: LENGTH
Attribute_Definition: Arc length
Attribute:
Attribute_Label: NE35113F4_CON#

Attribute_Definition: Arc/Info internal ID
Attribute:
Attribute_Label: NE35113F4_CON-ID
Attribute_Definition: Sequential user ID
Attribute:
Attribute_Label: ELEV
Attribute_Definition: Contour elevation
Attribute_Domain_Values:
Range_Domain:
Range_Domain_Minimum: 398
Range_Domain_Maximum: 747
Attribute_Units_of_Measure: meters
Beginning_Date_of_Attribute_Values: March 27, 2000
Ending_Date_of_Attribute_Values: April 07, 2000
Attribute_Value_Accuracy_Information:
Attribute_Value_Accuracy: 0.50 meter
Attribute_Value_Accuracy_Explanation: NMAS for 1 meter contours
Attribute:
Attribute_Label: $ID
Attribute_Definition: Arc/Info pseudo item
Attribute_Domain_Values:
Beginning_Date_of_Attribute_Values: March 27, 2000
Ending_Date_of_Attribute_Values: April 07, 2000
Attribute_Value_Accuracy_Information:
Attribute:
Attribute_Label: $FROMNODE
Attribute_Definition: Arc/Info pseudo item
Beginning_Date_of_Attribute_Values: March 27, 2000
Ending_Date_of_Attribute_Values: April 07, 2000
Attribute:
Attribute_Label: $TONODE
Attribute_Definition: Arc/Info pseudo item
Attribute:
Attribute_Label: $LEFTPOLYGON
Attribute_Definition: Arc/Info pseudo item
Attribute:
Attribute_Label: $RIGHTPOLYGON
Attribute_Definition: Arc/Info pseudo item
Overview_Description:
Entity_and_Attribute_Overview: Elevations of contours represented in data set by vectors.

Distribution_Information:
Distributor:
Contact_Information:
Contact_Person_Primary:
Contact_Person: Steve Mietz
Contact_Organization: Grand Canyon Monitoring and Research Center
Contact_Position: GIS Coordinator
Contact_Voice_Telephone: 520-556-7050
Contact_Facsimile_Telephone: 520-556-7368
Contact_Electronic_Mail_Address: smietz@usgs.gov
Standard_Order_Process:
Digital_Form:
Digital_Transfer_Information:
Format_Name: ARC
File_Decompression_Technique: No compression applied

Transfer_Size: 49.091
Digital_Transfer_Option:
Online_Option:
Computer_Contact_Information:
Network_Address:
Network_Resource_Name: <ftp://ftp.gcmrc.gov/data>
Access_Instructions: FTP download

Metadata_Reference_Information:
Metadata_Date: 20010426
Metadata_Contact:
Contact_Information:
Contact_Organization_Primary:
Contact_Organization: EarthData International of New Mexico
Contact_Person: Barry L. Roberts
Contact_Address:
Address_Type: mailing and physical address
Address:
5801 Osuna Rd NE Suite 105
City: Albuquerque
State_or_Province: New Mexico
Postal_Code: 87109
Country: USA
Contact_Voice_Telephone: 505-872-0207
Metadata_Standard_Name: FGDC Content Standards for Digital Geospatial Metadata
Metadata_Standard_Version: FGDC-STD-001-1998
Metadata_Time_Convention: local time
Metadata_Extensions:
Online_Linkage: <http://www.esri.com/metadata/esriprof80.html>
Profile_Name: ESRI Metadata Profile

Appendix B. Raster Metadata Example.

This example is provided as an example to the minimum required metadata components that should be included in any raster or imagery data product that is supplied to the GCMRC. Additional metadata components may be necessary depending upon the delivered product and will be determined by the GCMRC.

FL0002EXP0001

Metadata:

- Identification_Information
- Data_Quality_Information
- Spatial_Data_Organization_Information
- Spatial_Reference_Information
- Entity_and_Attribute_Information
- Distribution_Information

- Metadata_Reference_Information

Identification_Information:
Citation:
Citation_Information:
Originator: EarthData International of New Mexico
Publication_Date: 20001121
Title: FL0002EXP0001
Edition: One
Geospatial_Data_Presentation_Form: Map
Publication_Information:
Publication_Place: Flagstaff, Arizona
Publisher: Grand Canyon Monitoring and Research Center
Other_Citation_Details:
Online_Linkage: ftp.gcmrc.gov/data
Larger_Work_Citation:
Citation_Information:
Originator:
Publication_Date:
Title: FL0002EXP0001
Publication_Information:
Publication_Place:
Publisher:
Online_Linkage:
Description:
Abstract:
Panchromatic (Black and White) aerial photography was collected in stereo with 60 percent forward overlap during low water level (8000 CFS) using a Kodak 4096 by 4096 CCD digital camera. Resulting ground sample distance is approximately 0.99 feet per pixel. Imagery is not geo-referenced or orthorectified. Camera positional and pointing parameters are located in Entity and Attribute Information overview.
Purpose:
The aerial photography will be used for scientific research and production of GIS products.
Supplemental_Information:
Time_Period_of_Content:
Time_Period_Information:
Range_of_Dates/Times:
Beginning_Date: 20000327
Currentness_Reference: Publication Date
Status:
Progress: Complete
Maintenance_and_Update_Frequency: None planned
Spatial_Domain:
Bounding_Coordinates:
West_Bounding_Coordinate: -111.4866
East_Bounding_Coordinate: -111.4700
North_Bounding_Coordinate: 36.9324
South_Bounding_Coordinate: 36.9191
Keywords:
Theme:
Theme_Keyword_Thesaurus: None
Theme_Keyword: Aerial Photography
Theme_Keyword: Panchromatic
Theme_Keyword: Digital Camera
Place:

Place_Keyword_Thesaurus: None
Place_Keyword: Grand Canyon
Place_Keyword: Colorado River
Place_Keyword: Arizona
Access_Constraints: None
Use_Constraints: None
Point_of_Contact:
Contact_Information:
Contact_Organization_Primary:
Contact_Organization: Grand Canyon Monitoring and Research Center
Contact_Person: Steve Mietz
Contact_Position: GIS Coordinator
Contact_Address:
Address_Type: mailing and physical address
Address: 2255 North Gemini Drive
City: Flagstaff
State_or_Province: Arizona
Postal_Code: 86001
Country: United States
Contact_Voice_Telephone: 520-556-7050
Contact_Facsimile_Telephone: 520-556-7368
Contact_Electronic_Mail_Address: smietz@usgs.gov
Hours_of_Service: 8am-5pm, Mountain Time
Native_Data_Set_Environment: Windows NT Version 4.0

Data_Quality_Information:
Attribute_Accuracy:
Attribute_Accuracy_Report:
All coordinate information was derived from airborne global positioning system (GPS) data and applied to non-orthorectified aerial photography and is therefore only approximate. Aircraft position and attitude were recorded using airborne GPS and inertial measurement unit (IMU) systems. During GPS data collection, the Positional Dilution of Precision (PDOP) was continuously monitored. Every effort was made to perform data collection at times where the PDOP was 3.5 or below. In addition, some flight lines were recollected in an attempt to reduce the PDOP value. Aircraft attitude was recorded using an Applanix Phalanx IMU. Manufacturer specifications for this system indicate a post-processed accuracy of 0.004 degrees RMS for roll and pitch and 0.008 degrees RMS for true heading. For more information, including plots of forward and reverse GPS solution residuals, refer to the report titled "LIDAR and Digital Imagery Mapping of the Grand Canyon, Arizona" available from the Grand Canyon Monitoring and Research Center.
Logical_Consistency_Report:
Completeness_Report:
Positional_Accuracy:
Horizontal_Positional_Accuracy:
Horizontal_Positional_Accuracy_Report:
Typical residuals from forward and reverse GPS solutions for easting and northing were 10 cm or less. Residuals as high as 20 cm were recorded during non-collection aircraft maneuvering such as end of flight line turns. For more information, including plots of forward and reverse GPS solution residuals, refer to the report titled "LIDAR and Digital Imagery Mapping of the Grand Canyon, Arizona" available from the Grand Canyon Monitoring and Research Center.
Vertical_Positional_Accuracy:
Vertical_Positional_Accuracy_Report:
Typical residuals from forward and reverse GPS solutions for were 15 cm or less. Residuals as high as 80 cm were recorded during non-collection aircraft maneuvering such as end of flight line turns. For more information, including plots of forward and reverse GPS solution residuals, refer to the report titled "LIDAR and Digital Imagery Mapping of the Grand Canyon, Arizona" available from the Grand Canyon Monitoring and Research Center.

Lineage:
Source_Information:
Source_Citation:
Citation_Information:
Originator: EarthData International
Source_Scale_Denominator: 1:34000
Type_of_Source_Media: Direct digital capture
Source_Time_Period_of_Content:
Time_Period_Information:
Range_of_Dates/Times:
Beginning_Date: 18:35:55.035 GMT 20000327
Source_Citation_Abbreviation:
Source_Contribution:
Process_Step:
Process_Description:
Imagery was collected using a Kodak MegaPlus 16.8I 4096 by 4096 CCD digital camera using a 90mm length lens. Each CCD element is 9 microns by 9 microns in size. Exterior orientation information for the camera were derived using airborne GPS and inertial measurement systems.
Source_Used_Citation_Abbreviation:
Process_Date: 20001121
Source_Produced_Citation_Abbreviation:
Process_Contact:
Contact_Information:
Contact_Person_Primary:
Contact_Person:
Contact_Organization: EarthData International, New Mexico
Contact_Position: GIS Coordinator
Contact_Address:
Address_Type: mailing and physical address
Address: 5801 Osuna Rd. NE, Suite 105
City: Albuquerque
State_or_Province: New Mexico
Postal_Code: 87109
Country: United States
Contact_Voice_Telephone: 505-872-0207
Contact_Facsimile_Telephone: 505-872-0209
Contact_Electronic_Mail_Address:
Hours_of_Service: 8am-5pm Mountain Time

Spatial_Data_Organization_Information:
Direct_Spatial_Reference_Method: Raster
Raster_Object_Information:
Raster_Object_Type: Pixel
Row_Count: 4096
Column_Count: 4096
Vertical_Count: 1

Spatial_Reference_Information:
Horizontal_Coordinate_System_Definition:
Planar:
Grid_Coordinate_System:
Grid_Coordinate_System_Name: State Plane Coordinate System 1983
State_Plane_Coordinate_System:
SPCS_Zone_Identifier: Arizona, Central
Transverse_Mercator:
Scale_Factor_at_Central_Meridian: 0.999900

Longitude_of_Central_Meridian: -111.916667
Latitude_of_Projection_Origin: 31.000000
False_Easting: 213360.000000
False_Northing: 0.000000
Planar_Coordinate_Information:
Planar_Coordinate_Encoding_Method: Row and column
Coordinate_Representation:
Abscissa_Resolution:
Ordinate_Resolution:
Planar_Distance_Units: Meters
Geodetic_Model:
Horizontal_Datum_Name: North American Datum of 1983
Ellipsoid_Name: SPCS_Zone_Identifier
Semi-major_Axis: 6378137.0000000
Denominator_of_Flattening_Ratio: 298.26

Entity_and_Attribute_Information:
Overview_Description:
Entity_and_Attribute_Overview:
Kodak MegaPlus 16.8I digital camera. Calibrated focal length: 91.690 mm. Camera position and orientation from airborne GPS and IMU X Y Z (MSL) Omega Phi Kappa 252414.429 657324.455 4043.021 -3.45810 -0.16945 102.81257 Time and day of the exposure: 18:35:55.035 GMT 20000327 Approximate photograph corner coordinates as projected from the airborne GPS photo center coordinate data collected simultaneously with the photography: 1 253154.090 656858.890 2 251948.870 656584.790 3 251674.770 657790.020 4 252879.990 658064.120
Entity_and_Attribute_Detail_Citation:

Distribution_Information:
Distributor:
Contact_Information:
Contact_Organization_Primary:
Contact_Organization: Grand Canyon Monitoring and Research Center
Contact_Person: Steve Mietz
Contact_Position: GIS Coordinator
Contact_Address:
Address_Type: mailing and physical address
Address: 2255 North Gemini Drive
City: Flagstaff
State_or_Province: Arizona
Postal_Code: 86001
Country: United States
Contact_Voice_Telephone: 520-556-7050
Contact_Facsimile_Telephone: 520-556-7368
Contact_Electronic_Mail_Address: smietz@usgs.gov
Hours_of_Service: 8am-5pm Mountain Time
Resource_Description: March/April 2000 Grand Canyon Digital Camera Aerial Photography
Distribution_Liability:

Metadata_Reference_Information:
Metadata_Date: 20001121
Metadata_Review_Date: 20001121
Metadata_Contact:
Contact_Information:
Contact_Organization_Primary:
Contact_Organization: EarthData International, New Mexico
Contact_Person:

Contact_Position: GIS Coordinator
Contact_Address:
Address_Type: Mailing and physical address
Address: 5801 Osuna Rd. NE, Suite 105
City: Albuquerque
State_or_Province: New Mexico
Postal_Code: 87109
Country: United States
Contact_Voice_Telephone: 505-872-0207
Contact_Facsimile_Telephone: 505-872-0209
Contact_Electronic_Mail_Address:
Hours_of_Service: 8am-5pm Mountain Time
Metadata_Standard_Name: FGDC CSDGM
Metadata_Standard_Version: FGDC-STD-001-1998
