

Preservation Action Plan: Geospatial Records National Archives and Records Administration (NARA)

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Electronic Record or Digital Surrogate Types and Associated Formats

A geographic information or geographical information system (GIS) is a system for creating, storing, analyzing and managing spatial data and associated attributes. In the strictest sense, it is a computer system capable of integrating, storing, editing, analyzing, sharing, and displaying geographically-referenced information. In a more generic sense, GIS is a tool that allows users to create interactive queries (user created searches), analyze the spatial information, and edit data.

Essential Characteristics of this Record Type

GIS map overlays integrate spatial data with attribute data about map features. The overlays combine information from one map layer with another map layer to derive or infer an attribute for one of the layers. All layers must match up correctly to be able to draw them on top of each other or combine them to see relationships. For layers to match up, they must be in the same map projection and coordinate system, which allows one to specify a unique and definite position for every location on a map. Some appearance characteristics are covered in the Behavior Characteristics section, since often a GIS's value is in the many ways data can be manipulated and displayed.

Appearance/Layout characteristics are essential to preserve the accuracy and meaning of GIS map layers. The geographic information in a GIS digital map provides the position and shape of each feature. The information describes how the map is to be displayed or plotted. Common display information includes feature colors, line widths, and line types.

Appearance

Name	Definition	Function Description
Layout/Scale	Ratio of the distance on a map to the corresponding distance on the surface the map represents	

Layout/Orientation	Absolute geographic coordinate position: specified using a universal coordinate system such as latitude/longitude or Universal Transverse Mercator coordinates; Relative coordinate position: specified using the location of other variables or phenomena.	
Layout/Projection	Translates the locations on the globe onto the flat surface of a map.	
Text	Font; Orientation: text direction (left to right, angled, vertical, etc.); Color	These characteristics may be essential if the text displayed in GIS records, such as map legends or display headings, bears meaning through its formatting. The text itself is always essential, but the formatting may also be essential when it is evidence of how the maps were used or displayed by the creator.
Color	Hue; Saturation; Brightness (Light Source and Light Intensity for shadowing/shading); Contrast	Even if exact colors cannot be made persistent, distinctions between colors may be essential to understand the attributes and overlays displayed as a result of a user query. All of these characteristics are ways of measuring and making distinctions between colors. The International Color Consortium and Microsoft Windows Image Color Management profiles define standard methods of generating and interpreting numeric values that describe color to ensure color consistency across platforms and devices.

Structure

Name	Definition	Function Description
Layout/Linkage(s)	Linkage to geographic, attribute, and display data	

Behavior

Name	Definition	Function Description
Query	Queries may be graphics-driven, spatial based (point and query) searches for objects and retrieval of the associated attribute data. They may also be data-driven, using data values to display the matching spatial features or the use of attribute values to determine shading pattern of the relevant spatial elements.	
Display Graph or Plot	Features on one data layer are overlaid onto those of other data layers in order to show areas which have a certain combination of attributes: Single map; Multiple overlays; 3-dimensional display	The ability to graph and plot data is essential to the meaning of GIS map records. If there is no value to the map display, or no ability to plot, then the records could be handled much like databases.
Display Report	Report(s) from data tables	
Manipulation Functionality	Includes but not limited to: Draw; Zoom; Animate (continuous and/or step-by-step progression); Contour; Pan; Enhance (smooth, simplify, merge, dissolve, rotate, invert)	Depending on the software toolkit and data elements available to the user, a host of behaviors are possible that may be essential to the meaning or value of the records. Much GIS functionality concerns manipulation of the display, whether it be a plotted map or reported data from a query. The data elements that allow this functionality are a function of the data type and transfer

		format. If the records' value lies in how the creator manipulated map attributes and the utilities they used to do so, these behaviors will have to be identified and articulated at appraisal or transfer.
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Context

Name	Definition	Function Description
Descriptive Metadata	GIS records could contain, or link to, metadata that describe any attribute that could be displayed on a map, such as the Federal Geographic Data Committee's Content Standard for Digital Geospatial Metadata. The records may also be described by more specialized metadata profiles, such as the Metadata Standard for Shoreline Data.	All of the descriptive metadata employed by the record creator are presumed essential to the value of GIS records, because they are what make the records unique and meaningful.

Current NARA Transfer Guidance for this Record Type

Preferred:

- Geospatial Tagged Image File Format
- Geographic Markup Language
- Topologically Integrated Geographic Encoding and Referencing Files
- Keyhole Markup Language

Acceptable:

- Vector Product Format
- ESRI ARC/INFO Interchange File Format
- TerraGo Geospatial PDF
- ESRI Shapefile (Compound)

Archives Catalog. These references do not represent recommended public access formats under NARA policies. They are intended for informational purposes only.

Reference Format: Shapefile and GeoPDF

Public Access Format: Shapefile, GeoPDF, PDF

ESRI Shapefile (Compound Container File)

NARA Format ID: NF00174

Extension(s):

- shp
- sbn
- dbf
- prj
- shx
- sbx

Documentation

- <http://www.loc.gov/preservation/digital/formats/fdd/fdd000280.shtml>
- <http://www.nationalarchives.gov.uk/PRONOM/Format/proFormatSearch.aspx?status=detailReport&id=328>
- <https://www.esri.com/library/whitepapers/pdfs/shapefile.pdf>

Risk and Prioritization Analysis

- Low Risk
 - Moderate Risk
 - High Risk
- 5 Numeric Risk Rating
3 Numeric Prioritization Rating

Proposed Preservation Plan

- Retain file format in its existing format.
- Transform file to a new format.
Selected Format:
- Procure/develop tools to preserve, manage and provide access to records of this type in their existing form.
- Procure/develop tools to transform the format to the preferred normalized form.
- Provide Additional Information so that the record type remains understandable/usable over time.
- Explore Additional Options

Justification: The file format is well documented, is recognized as a preservation format, and is commonly accepted as a format throughout the federal government.

Preferred Processing and Transformation Tool(s)

- FME Desktop or Server
- Global Mapper

Preferred Viewer/Access Software

- FME Desktop or Server
- Global Mapper

ESRI World File

NARA Format ID: NF00175

Extension(s):

- wld
- blw
- bpw
- bqw
- gfw
- tfw

Documentation

- <https://www.loc.gov/preservation/digital/formats/fdd/fdd000287.shtml>
- <http://desktop.arcgis.com/en/arcmap/10.3/manage-data/raster-and-images/world-files-for-raster-datasets.htm>
- http://webhelp.esri.com/arcims/9.3/General/topics/author_world_files.htm

Risk and Prioritization Analysis

- Low Risk
- Moderate Risk
- High Risk
- 5** Numeric Risk Rating
- 3** Numeric Prioritization Rating

Proposed Preservation Plan

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- Transform file to a new format.
Selected Format:
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Preferred Processing and Transformation Tool(s)

- FME Desktop or Server
- Global Mapper

Preferred Viewer/Access Software

- FME Desktop or Server
- Global Mapper

ESRI ARC/INFO Interchange File Format

NARA Format ID: NF00175

Extension(s):

- eoo

Documentation

- <http://www.loc.gov/preservation/digital/formats/fdd/fdd000291.shtml>
- <https://support.esri.com/en/technical-article/000004705>
- <https://www.safe.com/integrate/e00/>

Risk and Prioritization Analysis

- ✓ Low Risk
- Moderate Risk
- High Risk
- 5 Numeric Risk Rating
- 5 Numeric Prioritization Rating

Proposed Preservation Plan

- Retain file format in its existing format.
- ✓ Transform file to a new format.
 - Selected Format:** KML, Shapefile, or GML
- Procure/develop tools to preserve, manage and provide access to records of this type in their existing form.
- Procure/develop tools to transform the format to the preferred normalized form.
- Provide Additional Information so that the record type remains understandable/usable over time.
- Explore Additional Options

Justification: The file format is proprietary and although it can be converted into ASCII, it then loses its inherent geospatial properties.

Preferred processing Tool(s):

- FME Desktop or Server
- Global Mapper

Preferred Viewer/Access Software

- FME Desktop or Server
- Global Mapper

Geographic Markup Language (GML)

NARA Format ID: NF00200

Extension(s):

- gml

Documentation

- <http://www.loc.gov/preservation/digital/formats/fdd/fdd000296.shtml>
- <http://www.nationalarchives.gov.uk/PRONOM/Format/proFormatSearch.aspx?status=detailReport&id=319>
- <http://www.nationalarchives.gov.uk/PRONOM/Format/proFormatSearch.aspx?status=detailReport&id=1852>

Risk and Prioritization Analysis

- Low Risk
 - Moderate Risk
 - High Risk
- 44 Numeric Risk Rating
44 Numeric Prioritization Rating

Proposed Preservation Plan

- Retain file format in its existing format.
- Transform file to a new format.
Selected Format:
- Procure/develop tools to preserve, manage and provide access to records of this type in their existing form.
- Procure/develop tools to transform the format to the preferred normalized form.
- Provide Additional Information so that the record type remains understandable/usable over time.
- Explore Additional Options

Justification: The file format is well documented and there are open source tools available for transcoding in the future if needed.

Preferred Processing and Transformation Tool(s)

- FFMPEG

Preferred Viewer/Access Software

- Microsoft Windows Player
- Adobe Premiere Pro with **FLAC** plugin

Keyhole Markup Language

NARA Format ID: NF00222

Extension(s):

- kml

Documentation

- <https://www.loc.gov/preservation/digital/formats/fdd/fdd000340.shtml>
- <http://fileformats.archiveteam.org/wiki/KML>
- https://en.wikipedia.org/wiki/Keyhole_Markup_Language

Risk and Prioritization Analysis

- Low Risk
- Moderate Risk
- High Risk
- 44 Numeric Risk Rating
- 44 Numeric Prioritization Rating

Proposed Preservation Plan

- Retain file format in its existing format.
- Transform file to a new format.
Selected Format:
- Procure/develop tools to preserve, manage and provide access to records of this type in their existing form.
- Procure/develop tools to transform the format to the preferred normalized form.
- Provide Additional Information so that the record type remains understandable/usable over time.
- Explore Additional Options

Justification: The file format is Preferred, well documented, and there are open source tools available for transcoding in the future if needed.

Preferred Processing and Transformation Tool(s)

- FFMPEG

Preferred Viewer/Access Software

- Microsoft Windows Player
- Adobe Premiere Pro with **FLAC** plugin

File Format Name: Geographic Tagged Image File Format (GeoTIFF)

NARA Format ID: NF00201

Extension(s):

- **gtiff**
- **tif**
- **tiff**

Documentation

- <http://www.loc.gov/preservation/digital/formats/fdd/fdd000279.shtml>
- <http://www.nationalarchives.gov.uk/PRONOM/Format/proFormatSearch.aspx?status=detailReport&id=798>

Risk and Prioritization Analysis

- Low Risk**
 - Moderate Risk**
 - High Risk**
- 29 Numeric Risk Rating**
29 Numeric Prioritization Rating

Proposed Preservation Plan

- Retain** file format in its existing format.
- Transform** file to a new format.
Selected Format:
- Procure/develop tools** to preserve, manage and provide access to records of this type in their existing form.
- Procure/develop tools** to transform the format to the preferred normalized form.
- Provide Additional Information** so that the record type remains understandable/usable over time.
- Explore Additional Options**

Justification: The file format is well documented and has good support by several tools in the marketplace.

Preferred processing Tool(s):

Any application that can open a TIFF file can open a GeoTIFF; the geographic information is located in the header or a sidecar file.

- FME Desktop or Server

- Global Mapper

Preferred Viewer/Access Software

Any application that can open a TIFF file can open a GeoTIFF, but rendering requires a GIS application.

- FME Desktop or Server
- Global Mapper

Spatial Data Transfer Standard (SDTS)

NARA Format ID: NF00408

Extension(s):

- ddf

Documentation

- <http://www.loc.gov/preservation/digital/formats/fdd/fdd000286.shtml>
- <https://mcmcweb.er.usgs.gov/sdts/>
- <https://mcmcweb.er.usgs.gov/sdts/standard.html#view>
- <https://spatialreserves.wordpress.com/2018/04/02/spatial-data-converter-for-dlg-files/>

Risk and Prioritization Analysis

- Low Risk
 - Moderate Risk
 - High Risk
- 13 Numeric Risk Rating
13 Numeric Prioritization Rating

Proposed Preservation Plan

- Retain file format in its existing format.
- Transform file to a new format.
Selected Format: TIFF or shapefile if possible
- Procure/develop tools to preserve, manage and provide access to records of this type in their existing form.
- Procure/develop tools to transform the format to the preferred normalized form.
- Provide Additional Information so that the record type remains understandable/usable over time.
- Explore Additional Options

Justification: Transformation is required as the software is no longer supported by the manufacturer or sold in the marketplace. The file format is abandoned and was almost universally despised for its cumbersomeness and difficulty in converting SDTS data to a usable GIS data.

Preferred Processing and Transformation Tool(s)

- FME Desktop or Server

- Global Mapper
- <https://mygeodata.cloud/converter/sdts-to-tiff>

Preferred Viewer/Access Software

- FME Desktop or Server
- Global Mapper
- <https://mygeodata.cloud/converter/sdts-to-tiff>

TerraGo GeoPDF

NARA Format ID: NF00425

Extension(s):

- pdf

Documentation

- https://www.usna.edu/Users/oceano/pguth/md_help/html/geopdf.htm
- <http://www.loc.gov/preservation/digital/formats/fdd/fdd000312.shtml>

Risk and Prioritization Analysis

Low Risk

Moderate Risk

High Risk

13 Numeric Risk Rating

13 Numeric Prioritization Rating

Proposed Preservation Plan

Retain file format in its existing format.

Transform file to a new format.

Selected Format:

Procure/develop tools to preserve, manage and provide access to records of this type in their existing form.

Procure/develop tools to transform the format to the preferred normalized form.

Provide Additional Information so that the record type remains understandable/usable over time.

Explore Additional Options

Justification: The file format is proprietary but well documented, in common use in the federal government (such as the distribution of The National Map), and there is an open standard version.

Preferred Processing and Transformation Tool(s)

- TerraGo

Preferred Viewer/Access Software

- None - the specialized extended metadata in the header requires them to be transcoded to access them.

Topologically Integrated Geographic Encoding and Referencing Files (TIGERLine)

NARA Format ID: NF00426

Extension(s):

- eoo
- ft#
- rt#
- shp

Documentation

- <https://www.census.gov/geo/maps-data/data/tiger-line.html>
- https://www.gdal.org/drv_tiger.html

Risk and Prioritization Analysis

Low Risk

Moderate Risk

High Risk

31 Numeric Risk Rating

31 Numeric Prioritization Rating

Proposed Preservation Plan

Retain file format in its existing format.

Transform file to a new format.

Selected Format: TBD

Procure/develop tools to preserve, manage and provide access to records of this type in their existing form.

Procure/develop tools to transform the format to the preferred normalized form.

Provide Additional Information so that the record type remains understandable/usable over time.

Explore Additional Options

Justification: Retain until additional options are identified. The file format is not well documented, only older versions of the AVID software (Pro Tools) allow for conversion. There are a very small number of files in the holdings and there are limited tools available for transcoding.

Preferred Processing and Transformation Tool(s)

- FME Desktop

Preferred Viewer/Access Software

- FME Desktop

Vector Product Format (VPF)

NARA Format ID: NF00433

Extension(s):

- Primitive
- csi
- Connected Node Spatial Index
- dht

Documentation

- <http://www.loc.gov/preservation/digital/formats/fdd/fdd000302.shtml>
- <https://repository.uneca.org/bitstream/handle/10855/14783/Bib-56405.pdf?sequence=1>
- <http://desktop.arcgis.com/en/arcmap/10.3/tools/coverage-toolbox/the-vector-product-format.htm>
- http://earth-info.nga.mil/publications/specs/printed/2407/2407_VPF.pdf
- <http://earth-info.nga.mil/publications/specs/printed/VPF/vpf.html>

Risk and Prioritization Analysis

- Low Risk
 - Moderate Risk
 - High Risk
- 10 Numeric Risk Rating
10 Numeric Prioritization Rating

Proposed Preservation Plan

- Retain file format in its existing format.
- Transform file to a new format.
Selected Format:
- Procure/develop tools to preserve, manage and provide access to records of this type in their existing form.
- Procure/develop tools to transform the format to the preferred normalized form.
- Provide Additional Information so that the record type remains understandable/usable over time.
- Explore Additional Options

Justification: The file format is well documented, and a standard used by the US armed forces. The standard has not changed since 1996, so this format should be monitored for continued support.

Preferred Processing and Transformation Tool(s)

- Format is to be retained.
- ESRI ArcGIS

Preferred Viewer/Access Software

- GDAL with OGDl Vectors driver
- MapLink Pro
- ESRI ArcGIS.

Raster Product Format (RPF)

NARA Format ID: NF00433

Extension(s):

- TOC
- ovr
- I41

Documentation

- <https://www.loc.gov/preservation/digital/formats/fdd/fdd000298.shtml>
- http://earth-info.nga.mil/publications/specs/printed/2411/2411_RPF.pdf
- http://earth-info.nga.mil/publications/specs/printed/2411/2411_1.pdf
- http://earth-info.nga.mil/publications/specs/printed/2411/2411_2.pdf

Risk and Prioritization Analysis

- Low Risk
 - Moderate Risk
 - High Risk
- 10 Numeric Risk Rating**
0 Numeric Prioritization Rating

Proposed Preservation Plan

- Retain file format in its existing format.
- Transform file to a new format.
Selected Format:
- Procure/develop tools to preserve, manage and provide access to records of this type in their existing form.
- Procure/develop tools to transform the format to the preferred normalized form.
- Provide Additional Information so that the record type remains understandable/usable over time.
- Explore Additional Options

Justification: The file format is well documented, and a standard used by the US armed forces. The standard has not changed since 1994, so this format should be monitored for continued support.

Preferred Processing and Transformation Tool(s)

- Format is to be retained.
- Controlled Image Base (CIB)

Preferred Viewer/Access Software

- Controlled Image Base (CIB)
- Compressed ARC Digitized Raster Graphic (CADRG)
- Digital Point Positioning Data Base (DPPDB)