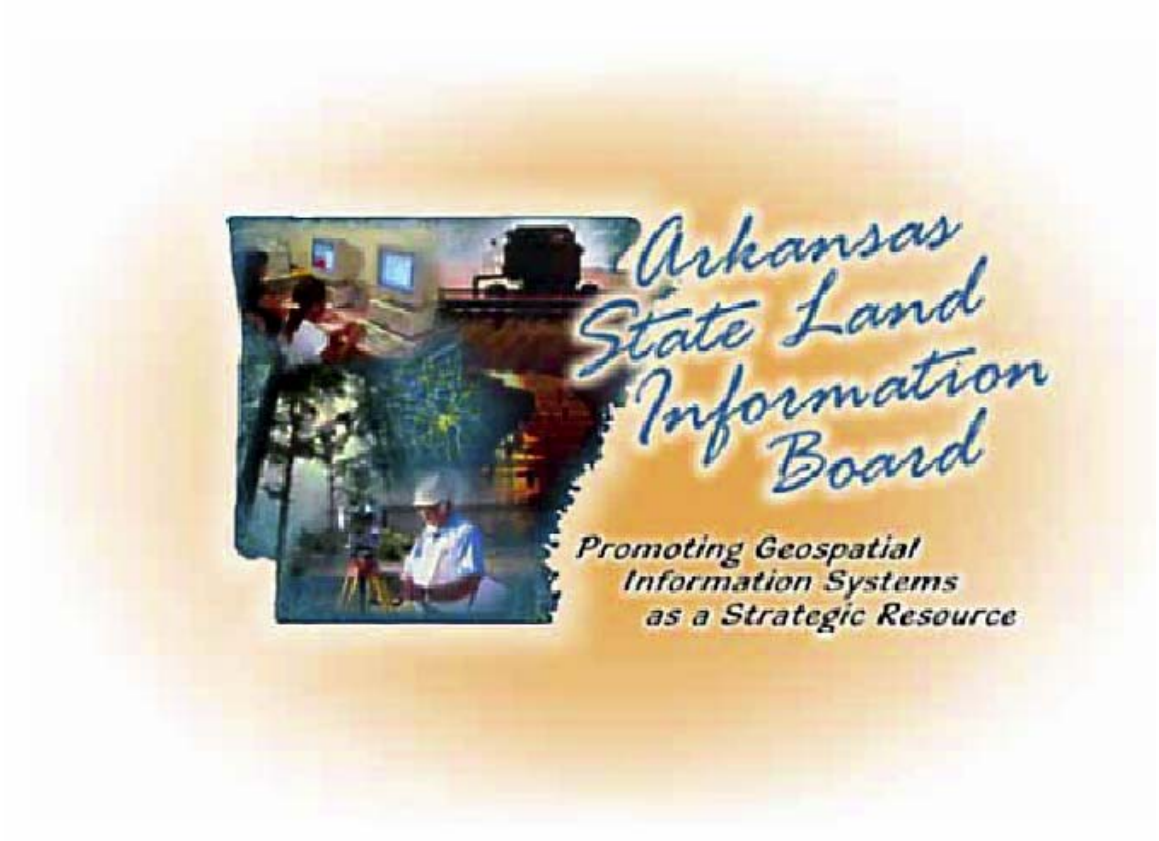
Proposed
Arkansas Centerline File
Standard



Prepared By: Arkansas Centerline I-Team Subcommittee

For: Arkansas State Land Information Board

Presented to the Arkansas State Land Information Board November 28, 2001
Adopted by the Arkansas State Land Information Board June 18, 2002
Presented for Public Review June 19, 2002
Submitted to the Bureau of Legislative Research
Became an official state rule / regulation

Table of Contents

* For the purposes of this document street (centerline) shall refer to any, bypass, interstate, cove, road, route or other means that typically supports automotive transportation.

Introduction

The State Land Information Board developed this document in order to support the legislative initiatives to establish the Arkansas Spatial Data Infrastructure (Arkansas Code 15-21-5). Spatial data layers are often stored digitally and accessed through a relational database management system (RDBMS). Although the centerline file is a component of the Arkansas Spatial Data Infrastructure, the way in which people format and maintain it can differ. People often disagree on the way a particular spatial data layer structure should be organized. This can pose problems in terms of sharing, locating and extracting spatial data information. It is intended that these standards will benefit the Geographic Information Systems (GIS) user communities in numerous ways, including but not limited to; *The National Map Program*[1], The *TIGER Modernization Program*[2], E-911 applications, routing services and location dependant services.

The following standards specifically speak to methodologies for creating a seamless statewide Arkansas Centerline File with address ranges that are shareable, geocodable, and have a horizontal accuracy better than 10 meters.

Background

The State Land Information Board (SLIB) was created by Act 914 of the 1997 General Assembly and is responsible for:

- Identifying problems and solutions in implementing a spatial data repository
- Developing and coordinating a schedule for state spatial data projects
- Recommending methods of financing for state spatial data projects
- Providing educational programs that are focused on spatial data technologies
- Coordinating collaborative projects; and
- Establishing spatial data standards (Section 4. (f) (1) of Arkansas Code 15-21-5).

Arkansas Code 15-21-5 (An Act to Amend the Arkansas Code to Create the Geographic Information Office and Establish the Arkansas Spatial Data Infrastructure; (and for other purposes) establishes these SLIB principles:

- Validity, consistency, comprehensiveness, availability, and currentness of data are essential components of all automated land information systems.
- Coordination with federal, state, regional, county, and municipal agencies, state universities and colleges, private firms, and others who require the same spatial data will reduce duplication of efforts and expense.
- Creation of new data in an accurate and usable format in accordance with the states shared technology architecture will ensure availability across state agencies.

Purpose

This standard is intended to make centerline files more uniform and horizontally accurate. This will facilitate the sharing of a statewide seamless centerline spatial data layer. Adhering to these standards will insure the "usability" of the spatial data theme and its attributes by multiple entities. This standard will insure a consistent manner in which the centerline and/or attributes are collected. This will enable the data to be

merged seamlessly, and transferable regardless of creator or jurisdictional boundaries. All data used in the creation of the Arkansas Centerline File shall meet these standards.

*Note: Throughout the remainder of this document ACF shall refer to Arkansas Centerline File this includes the vector spatial data layer and its attributes. The ACF shall be composed of centerline files created from multiple sources and/or entities.

Technical Practices for Creating ACF vector layer

ACF Feature Type:

Vector lines shall be used to represent centerlines. The ACF shall "seamlessly" match across jurisdiction boundaries (i.e.-cities, counties, etc.). Address ranges shall be organized along the linear feature in a manner that will support theoretical addressing (geocoding). The address ranges shall be stored within the centerline attribute table of the geospatial dataset.

The centerline file shall be processed using appropriate GIS procedures to create and maintain accurate topology, if intended for incorporation into the ACF program. .

Digitizing:

Centerline files intended for incorporation into the ACF program may be produced utilizing heads-up digitizing techniques. Heads-up digitizing methodologies used may include but are not limited to: point mode, stream mode, spaghetti mode, increment mode or an arc/node mode. Heads-up digitizing should be performed utilizing the following standards.

Scale- 1:1,200
Projection- UTM Zone 15
Datum- North American Datum 1983 (NAD83)
Units- meters
Source- Second Generation Digital Ortho Quarter Quadrangles (DOQQ's) that have verified horizontal accuracies.

Attributes for the centerline file may be created utilizing manual or automated techniques that follow the technical practices outlined within this document.

Global Positioning Systems (GPS):

Centerline files intended for incorporation into the ACF program may be produced utilizing GPS. If GPS techniques are utilized the Arkansas Standards for Collecting Mapping Grade Global Positioning System Positions [3] shall be followed.

Technical Practices for Creating ACF Attributes

The following standards apply to the collection and maintenance of the centerline attributes that are intended for incorporation into the ACF program.

Minimum Standards for ACF Attributes:

Table 1

Field Name	Length	Type	Alpha Case	Description
PL_ADD_F	10	Alpha	NA	Primary Left From Address
PL_ADD_T	10	Alpha	NA	Primary Left To Address
PR_ADD_F	10	Alpha	NA	Primary Right From Address
PR_ADD_T	10	Alpha	NA	Primary Right To Address
PRE_DIR	2	Alpha	Upper	Primary Directional Prefix
PSTR_NAM	72	Alpha	Upper / lower	Primary Street Name
PSTR_TYPE	4	Alpha	Upper / lower	Primary Street Type
PSUF_DIR	2	Alpha	Upper	Primary Directional Suffix
CITY_L	30	Alpha	Upper / lower	City Name or Rural Left
CITY_R	30	Alpha	Upper / lower	City Name or Rural Right
CN_R_FIPS	3	Alpha	NA	County Fips code Right
CN_L_FIPS	3	Alpha	NA	County Fips code Left
STATE_L	2	Alpha	Upper	State Left
STATE_R	2	Alpha	Upper	State Right
ZIP5_L	5	Alpha	NA	Zip Code Left
ZIP5_R	5	Alpha	NA	Zip Code Left Right
ZIP4_L	4	Alpha	NA	+4 Zip Code Left
ZIP4_R	4	Alpha	NA	+4 Zip Code Right
UNIQUE_ID	25	Alpha	NA	Unique Identifer
META _ID	20	Alpha	NA	Metadata Identifier
ALTERNATE 1				
A1_LFADD	10	Alpha	NA	Alternative 1 Left From Address
A1_LTADD	10	Alpha	NA	Alternative 1 Left To Address
A1_RFADD	10	Alpha	NA	Alternative 1 Right From Address
A1_RTADD	10	Alpha	NA	Alternative 1 Right To Address
A1_STR	72	Alpha	Upper / lower	Alternative 1 Street Name

A1_DRPR	2	Alpha	Upper	Alternative 1 Directional Prefix
A1_STYP	4	Alpha	Upper / lower	Alternative 1 Street Type
A1_DRSF	2	Alpha	Upper	Alternative 1 Directional Suffix
ALTERNATE 2				
A2_LFADD	10	Alpha	NA	Alternative 2 Left From Address
A2_LTADD	10	Alpha	NA	Alternative 2 Left To Address
A2_RFADD	10	Alpha	NA	Alternative 2 Right From Address
A2_RTADD	10	Alpha	NA	Alternative 2 Right To Address
A2_STR	72	Alpha	Upper / lower	Alternative 2 Street Name
A2_DRPR	2	Alpha	Upper	Alternative 2 Directional Prefix
A2_STYP	4	Alpha	Upper / lower	Alternative 2 Street Type
A2_DRSF	2	Alpha	Upper	Alternative 2 Directional Suffix
ALTERNATE 3				
A3_LFADD	10	Alpha	NA	Alternative 3 Left From Address
A3_LTADD	10	Alpha	NA	Alternative 3 Left To Address
A3_RFADD	10	Alpha	NA	Alternative 3 Right From Address
A3_RTADD	10	Alpha	NA	Alternative 3 Right To Address
A3_STR	72	Alpha	Upper / lower	Alternative 3 Street Name
A3_DRPR	2	Alpha	Upper	Alternative 3 Directional Prefix
A3_STYP	4	Alpha	Upper / lower	Alternative 3 Street Type
A3_DRSF	2	Alpha	Upper	Alternative 3 Directional Suffix

*Note: The line in this instance is a linear geospatial theme that represents a centerline. Address ranges are typically established for individual centerline segments so address matching may be performed. Whenever practical, street names and address ranges shall conform to the actual situs addresses assigned.

The # symbol, hyphen's or other punctuations shall not be used in any part of centerline attribute files created with the intent to be incorporated into the ACF program.

Directional Prefixes & Suffixes:
Centerline files intended for incorporation into the ACF program shall use directional prefixes and suffixes established by the United States Postal Service. (Refer to Appendix A.) The directional prefixes and suffixes shall be uppercase.

Metadata Identifier:
Centerline files intended for incorporation into the ACF program shall have a metadata identifier that associates (links) the contributed file to its proper metadata.

Street Name:
When street names are numbers, the number shall be used rather than spelling it out. For example 1 rather than first. Names that are made up of numbers shall also include "th", "rd", "st" or "nd". The characters shall be included in the street name field. For example, if the street name is equivalent to 1st rather than street name 1, type "st".

Street names shall utilize capital and lower case letters. Common abbreviations are acceptable in the street name. These might include, but are not limited to DR (Doctor) or JR (Junior). This will insure the name fits the field length requirements.

Street Type:
Centerline files created with the intent to be incorporated into the ACF program shall use street abbreviations established by the United States Postal Service. The street type shall be composed of upper and lower case characters.

Unique Id:
Each line segment within the Arkansas Centerline File Program shall have a unique identifier. The unique identifier shall be composed of the state fips code, county fips code and an arbitrary 19 digit number assigned at the state level.

Additional Considerations

Updates / Maintenance:
A specific entity(s) shall be identified to insure that the ACF is updated and maintained in a timely manner. Following spatial or attribute updates and/or modifications performed to the ACF shall be submitted to the entity(s) responsible for performing quality control practices.

Quality Control:
Rigorous quality control techniques shall be implemented to insure the ACF has acceptable horizontal accurate and attribute integrity is maintained.

a) The themes / attributes may be compared to existing spatial data layers /databases of higher quality.
b) Database management techniques shall be utilized to insure attribute consistency.

c) Spatial data themes shall be topologically correct.

Horizontal Accuracy:
The National Standard for Spatial Data Accuracy (NSSDA)- part 3 shall be used to perform horizontal accuracy assessments on the ACF in several geographically dispersed areas. Centerline files created utilizing heads-up digitizing and GPS techniques shall be tested, utilizing NSSDA- part 3 techniques in various locations.

Digital ortho-rectified photography may also be used to perform horizontal accuracy assessments in a more efficient and economical manner. This will enable the testing of larger portions of the spatial data theme.

Note: The horizontal accuracy of the digital ortho-rectified photography must be determined prior to utilizing it as a verification of the horizontal accuracy of the ACF.

Metadata:
Centerline files intended for incorporation into the ACF program shall have Federal Geographic Data Committee (FGDC) compliant metadata created for each spatial data file. Compliant metadata shall be provided with centerline files that are created, updated, or distributed by any parties participating in the ACF program. The metadata shall be supplied with the ACF anytime it is distributed and/or transferred among participants or other entities responsible for creating, performing quality control, maintaining, updating, and/or distributing the ACF. The metadata shall be transferred in a FGDC standard format (i.e.- Z39.5, text or HTML file) and must have successfully passed through a FGDC compliant metadata parser.

ACF Program Participants:
Those participating in the ACF program shall follow the spatial, attribute and metadata standards set forth in this document.

Centerline files created prior to the ACF program may be contributed to the program if FGDC compliant metadata is supplied. If the data is not in compliance with this standard, ACF program participants may standardize the centerline file and/or its attributes and incorporate the centerline file into the ACF program.

Distribution:
The ACF shall be distributed digitally via GeoStor (Arkansas' Spatial Data Warehouse) at no cost to private or public users.

Definitions of Terms

Absolute Accuracy - A measure of the location of features on a map compared to their true position on the face of the earth.

Address Actual or **Real** - The simple, everyday element that designates a specific, situs location, such as a house number or an office suite.

Address matching - See **Geocoding**.

Address Range - set(s) of numbers usually comprised of four (4) distinct values that represent a theoretical situs address at either end of a centerline segment. Two numbers of the range represent the lowest addresses, while the other two represent the highest. The numbers are further distinguished as being on either the left or the right side of the segment. In topological terms, the low numbers are associated with the FROM node of the segment, while the high numbers are associated with the TO node. Likewise, left and right are determined by the direction of the segment, as defined by the FROM and TO nodes.

Attribute(s) - properties and characteristics of spatial data entities.

Arc/Node Mode – arcs and nodes are defined by the user as they are digitized

Entity - any object about which an organization chooses to collect data.

Increment Mode – points are collected every *n* millimeters from the previous point

Geocodable – an attribute database that is capable of being manipulated by GIS software to determine a theoretical address and its coordinates.

Geocoding - mechanism for building a database relationship between addresses and geospatial features. When an address is matched to the geospatial features geographic coordinates are assigned to the address.

Point Mode – single points are recorded one at a time

Range - Numbers associated with segments of a digital centerline file that represent the actual high and low addresses at either end of each segment.

Relative Accuracy - A measure of the accuracy of individual features on a map when compared to other features on the same map.

Situs - The proper or original position of a specific location. An element that designates a fixed site, such as the address of a property or building.

Stream Mode – points are collected on regular intervals or time or distance

Spaghetti Mode – points are collected every *n* milliseconds

Theoretical - A location that can be interpolated along a centerline file through geocoding software.

Topology – Spatial relationships and connectivity among graphic GIS features, such as points, lines and polygons. These relationships allow display and analysis of "intelligent" data in GIS. Many topological structures incorporate begin and end relationships, direction and right / left identification.

Vanity - A special address that is inconsistent with or an exception to the standard addressing schema.

Appendix A Directional Prefixes & Suffixes- United States Postal Service Abbreviations

E = East
N = North
NE = Northeast
NW = Northwest
S = South
SE = Southeast
SW = Southwest
W = West

References

[1] *National Map Program*- The U.S. Geological Survey (USGS) is committed to realigning and reinvigorating its topographic mapping activities to put truly current information into the hands of our customers, in a cost-effective way. Our vision is that, by working with partners, we will ensure that the Nation has access to and use of current, accurate, and nationally consistent base geographic information, including digital data and derived topographic maps. Our vision is documented in a report, *The National Map*. http://nationalmap.usgs.gov/

[2] *TIGER Modernization Program*- The U.S. Census Bureau (Census Bureau) intends to issue a solicitation for full and open competition for services in support of the MAF/TIGER Modernization Program. The selected contractor will be expected to provide services for the MAF/TIGER Modernization strategic program objective number 1- Improve Address/Street Location Accuracy; Implement Automated Change Detection. The scope of the solicitation is addressed in the accompanying draft "Statement of Objectives" (SOO). The approach in fulfilling the Census Bureau's requirement will involve an acquisition process that is best explained in terms of the order events. http://www.census.gov/geo/mod/SOODraft2.pdf

[3] *Arkansas Proposed Standards for Collecting Mapping Grade Global Positioning System Positions* (in review), Adopted by the Arkansas State Land Information Board August 29, 2001
http://www.gis.state.ar.us/LIB/AnnceGPS.asp

Sources

B. Ozanich, 1996, *E-911 Database Guide Second Edition,* National Emergency Number Association

Federal Geographic Data Committee, 1999, *NSDI Framework Transportation Identification Standards Draft 2*

MapInfo, 1999, *MapMarker Users Manual v. 5*

R. Orli, L. Blake, F. Santos, A. Ippilito, 1996 Richard J. Oril, 1996, *Address Data Quality and GeoCoding Standards,* derived from U.S. Department of Housing and Urban Development

Spatial Data Standards, 1999, *Spatial Data Standards- Facility Management Standards (software)*, U.S. Army Corps. Of Engineers, centerlines section

Street Address Working Group, November 24, 2000, *Addressing Standard V 1.15* (in review)*,* International Committee on Surveying & Mapping

SubCommittee on Cultural and Demographic Data, 2000, *Address Data Content Standard*, Federal Geodatic Data Committee

Acknowledgements- Arkansas I-Team Subcommittee

Christine Crawford: Chair	Arkansas One Call
Bill Richardson	Arkansas Highway and Transportation Department
Bob Scoggins	Arkansas Highway and Transportation Department
Brian Culpepper	Center for Advanced Spatial Technologies
Bryan Stewart:	Arkansas Highway and Transportation Department
Chris Boudreaux	Conway Corporation
Conya Spencer	Central Arkansas Planning and Development District
Craig Best	United States Bureau of the Census
Dale Enoch	Arkansas One Call
Dorothy Rhodes	Arkansas Highway and Transportation Department
Ed Crane	ESRI
Farrell Adams	Arkansas Highway and Transportation Department
Hilda Harris	Arkansas Highway and Transportation Department
John Zimple	Arkansas Assessment Coordination Department
Kathy Gunderman	Arkansas Highway and Transportation Department
Kit Carson	Arkansas Highway and Transportation Department
Larry Shanner	Pixxures
Learon Dalby	Arkansas Geographic Information Office
Margarett Sithong	Arkansas Highway and Transportation Department
Mike Gardner	University of Arkansas at Fort Smith
Paul Edwards	Arkansas Highway and Transportation Department
Randy Everett	North Arkansas Electric Cooperative
Randy Jones	First Electric
Robert Fuhler	Arkansas Highway and Transportation Department
Rusty Myers	Western Arkansas Planning and Development District
Sharon Baker	Arkansas Highway and Transportation Department
Shelby Johnson	Arkansas Geographic Information Office
Sonny Sanders	ESRI
Steve Teague	Arkansas Highway and Transportation Department
Susan Cromwell	Arkansas State Land Information Board Member- Chair
Suzanne Wiley	Arkansas State Land Information Board Member- Vice Chair
Teresa Cline	Central Arkansas Planning and Development District
Tim Mahan	Arkansas Highway and Transportation Department
Tina Thompson	Western Arkansas Planning and Development District
Todd Schroeder	First Electric
Tom Pemberton	Pixxures
Vince Gulliet	Carter and Burgess
Walter Simpson	Geographic Data Technologies (GDT)
Wes Flack	United States Bureau of the Census