Geographic Data Content Standard for Transportation Roads Data: Version 2

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Statewide Mapping Advisory Committee

Working Group for Roads and Transportation

Contents

Preface 3
Road Data Content Standard 4
Section 1: Introduction 4
Section 2: Definition 4
Section 3: General Data Requirements 4
Metadata Standards 4
Attribute Data 4
Simple Geometry - Centerline Feature Type 4
Section 4: Digital Graphic Construction 5
Digital Construction 5
Spatial Continuity 6
Coordinate System 6
Section 5: Non-Graphic Attributes 7

Preface

The Working Group for Roads and Transportation, as a part of the Geographic Coordinating Council (GICC), Statewide Mapping Advisory Committee (SMAC), updated this road centerline content standard. The first version was adopted by the GICC on May 11, 2005. Of the several areas of transportation: aviation, rail, etc., this standard has focused exclusively on roads. The reference used in updating this standard primarily was road centerline section of the NENA (National Emergency Number Association) Next Generation 911 GIS Data Model.

This standard models the road infrastructure as a component of the entire transportation system, consisting of public ways with a number of other routes that may either be paved or unpaved. Core non-graphic attributes for the transportation content include the state route number (where applicable), address component information, maintenance provider, zip code, service class, county, and other important centerline-related information.

This standard is not a mandate; data providers are encouraged, but not required to participate. It is not an implementation timeline; cooperating agencies are free to participate on their own schedule. The standard is not a business process; it is a minimum set of attributes required for exchange. Thus, organizations are not being asked to change their business processes, but to present for exchange the data they do have in a useable format. It is understood that all organizations will not have all attributes described in this standard. For example, all organizations may not maintain the attribute "RoadPostDirectionSuffix." It is only required that the data they are able to provide conform to the standard. The standard is also not a software application. In time, however, there could be applications developed to support this standard, making it as simple as practical to implement.

This standard will serve as a template to promote the merger of road centerline and corresponding attribute data in North Carolina from various levels of government data sources and data providers. The design of the standard will accentuate the strengths of the different data sets and promote data provider participation through further data refinements for mutual benefit. Because different agencies have independent functions and business processes, their data varies in schema, accuracy levels and content. The standard allows agencies to share common data in an expected and uniform method.

The Working Group for Roads and Transportation consists of these members who contributed to this standard:

Name	**Organization**
Erin Lesh, WGRT Chair	NC Department of Transportation
Greta Bumgarner	Catawba County
Dianne Enright	NC Department of Health and Human Services
Pokey Harris	NC 911 Board
Harry Lee	Currituck County
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Richard Taylor	NC 911 Board
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Road Data Content Standard

Section 1: Introduction

The Working Group for Roads and Transportation of the Statewide Mapping Advisory Committee has formulated this Road Data Content Standard that it believes will fulfill the objectives of NC OneMap and statewide geospatial data coordination with regards to the transportation framework layer.

The Road Data Content Standard is a minimum set of attributes and geometry descriptions for road features used for publication and distribution of transportation information by road data producers and maintainers. This standard is intended to provide sufficient information to support integrating basic transportation roadways across jurisdictional boundaries, answering fundamental questions for business processes dependent upon transportation, and serve as a basis for other functionality within IS applications (e.g., routing, geocoding).

This standard encompasses a definition of OGC simple features and associated attributes that describe the complete network of public and private roads cleared and maintained for the passage of motor vehicles. Core non-graphic attributes for the transportation content include address component information, zip code, service class, and county, among others.

It is hoped and encouraged that local jurisdictions are able to provide data conforming to this standard and that some of the detailed road attributes (maintained by the NCDOT-GIS Branch or private firms) can be integrated into the data as needed. City, county, regional, and state agency stakeholders jointly determined attributes in this standard.

Section 2: Definition

The Road Data Content Standard is designed as a digital representation in graphical format of the streets, highways and road infrastructure. Each digital road element contains attributes that define specific characteristics of the actual road to identify features and functions of a particular segment.

Section 3: General Data Requirements

Metadata Standards

Metadata is a crucial component of geospatial data and should be required for all geographic data produced. The metadata format is as determined by the GICC's State and Local Government GIS Metadata Profile.

Attribute Data

All required non-graphic attributes are identified in Section 5 of this document. The suggested field headers have not been revised. An additional column in the table in Section 5 indicates the associated attribute header in the NENA standard.

Simple Geometry - Centerline Feature Type

To maintain a consistent geographic database, the geometry requirements of this Road Data Content Standard are to provide shape, and geographic location, of a feature, e.g., centerlines. A feature shall be represented by the visually marked centerline of a bi-directional roadway or the approximate geometric center of an unmarked bi-directional or uni-directional roadway (e.g., divided highway). The feature shall consist of vector lines, constructed from a minimum set of ordered coordinates (vertices), such that the horizontal accuracy of the roadway is not degraded beyond recognition.

Centerline orientation shall be based on the ascending direction of a common linear measurement system such as address ranges or milepost values when available. For example, if a given roadway's address range starts at 1000, the route cannot have a 900 address following the direction of the roadway's orientation. If a common linear measurement system is not available for a given roadway, then the orientation shall be at the data author's discretion

but must remain consistent from start to finish. To illustrate, if a route starts in a northerly direction the orientation of all segments of that route will be recorded in a northerly direction.

Address ranges, if available, should be organized along the linear feature in a manner that will support address matching. The address ranges should be stored within the centerline non-graphic attribute table of the dataset (See Section 5: Non-Graphic Attributes).

Section 4: Digital Graphic Construction

The general construction requirements for this Road Data Content Standard components are outlined in the following subsections.

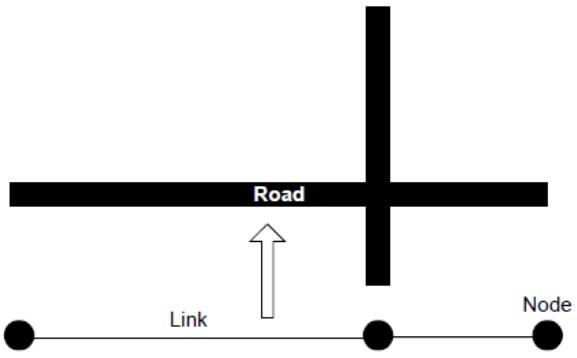
Digital Construction

The National Emergency Number Association (NENA) specializes in standardizing data to be used in public safety systems for the purpose of emergency response. This includes geometry standards and best practice components of Road Centerline geometry modeling. In most cases of geospatial data, the geometry and attributes work together to form the basis of centerline data development and maintenance. The Federal Highway Administration (FHWA) as well as the NCDOT also provide valuable insight on modeling centerline data and have specific guidelines for maintaining consistency in road centerline data development. The following components of geometric characteristics will determine consistency within North Carolina road centerline data.

Road features in the physical or real world consist of tangible objects such as roads, bridges, and intersections. At a minimum, representations of physical objects require enough information to enable someone to locate and recognize them in the real world. This standard supports the unambiguous identification of real-world features by requiring descriptive and qualitative positional information about each feature, and by allowing its augmentation with other information when users make it available.

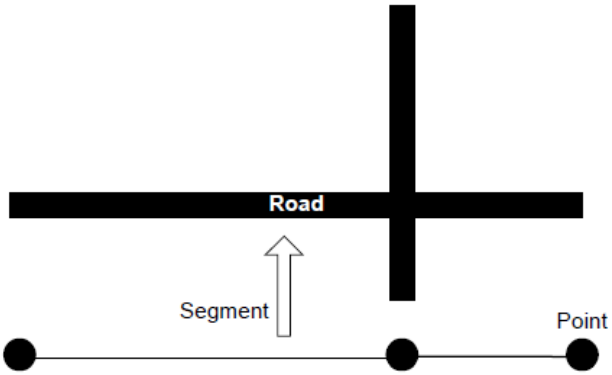
Planar coordinates define the relative locations and shapes of cartographic objects on a two-dimensional plane. These coordinates are typically transformations of real-world geographic coordinates. Each feature following this Road Data Content Standard will be defined within a specific coordinate system identified in "Coordinate System" below.

Cartographic objects are used to represent real-world features on a map. These real-world objects are displayed as points, lines, or polygons. Transportation networks or linear referencing systems (LRS) implement these concepts utilizing points (nodes or mile points, calibration points) and strings of line segments (links or routes) as illustrated below:



These transportation objects: links, nodes, mile points, calibration points and routes together form networks and linear referencing systems (LRS), and are inherently topological. Transportation networks and LRSs provide information on the feasible paths between specified locations. Once a network or LRS has been created, other

transportation application layers can be built upon it, including identified routes, linear referencing methods, linear referenced points, and linear events. All of these application layers can ultimately be mapped back to the transportation reference points and segments through specific network links and nodes on which these application layers were built.



Spatial Continuity

All data utilizing this standard should be spatially continuous. This requirement for spatial continuity means that the structure of the database will not inhibit the execution of software functions such as network trace across map or file boundaries or other artificial discontinuities such as model edges.

Coordinate System

The coordinate system required for all geographical data produced using this standard should be as determined by NC OneMap for all data frameworks. The current reference system is the North Carolina State Plane coordinate system, North American Datum 1983, and units of either US feet or meters.

Section 5: Non-Graphic Attributes

Suggested Header	Atttribute	NENA Attributes*	Description	Data Type+	Length	Values limited to "Null" or "unknown" allowed
SRNUM	StateRouteNumber		A descriptive number to be used as a label or road sign.	N	5	> 1,000 and < 50,000
RDNAME	RoadNameBody (formerly RoadName)	StreetName (M)	The officially designated name as determined by the street data steward.	A/N	50	No domain limit
PREDIR	RoadPrefix	St_PreDir (C) LSt_PreDir (C)	The geographic direction.	A	2	N, S, E, W, NE, NW, SE, SW
RDTYP	RoadType (formerly RoadSuffix)	LSt_Type (C)	The street type as referenced by the National Emergency Number Association (e.g., "RD," "ST").	A	4	http://www.nena9-1-1.org/9-1-1TechStandards/nena_recommended_standards.htm
SUFDIR	RoadPostDirectionSuffix	LStPostDir (C)	Additional information, typically geographic direction, that appears at the end of the road name.	A/N	2	No domain limit
RDOWNER	MaintenanceProvider		The entity responsible for the upkeep of the road.	N	1	1=State 2=Municipality 3=Private 4=Federal 5=Other (e.g., paper roads, county-maintained)
LOWLEFT	LeftLowAddress (formerly LeftFromAddress)	FromAddr_L (M)	The lowest house number on the left side of the street when facing in the direction of ascending house numbers. It is suggested that the addresses be coded based on the structures that actually exist on that road segment, rather than fixed ranges (e.g., block number ranges). Numbers should be coded as numerals, not spelled out.	N	8	> 0

Suggested Header	Atttribute	NENA Attributes*	Description	Data Type+	Length	Values limited to "Null" or "unknown" allowed
HIGHLEFT	LeftHighAddress (formerly LeftToAddress)	ToAddr_L (M)	The highest house number on the left side of the street when facing in the direction of ascending house numbers. It is suggested that the addresses be coded based on the structures that actually exist on that road segment, rather than fixed ranges (e.g., block number ranges). Numbers should be coded as numerals, not spelled out.	N	8	> 0
LOWRIGHT	RightLowAddress (formerly RightFromAddress)	FromAddr_R (M)	The lowest house number on the right side of the street when facing in the direction of ascending house numbers. It is suggested that the addresses be coded based on the structures that actually exist on that road segment, rather than fixed ranges (e.g., block number ranges). Numbers should be coded as numerals, not spelled out.	N	8	> 0
HIGHRIGHT	RightHighAddress (formerly RightToAddress)	ToAddr_R (M)	The highest house number on the right side of the street when facing in the direction of ascending house numbers. It is suggested that the addresses be coded based on the structures that actually exist on that road segment, rather than fixed ranges (e.g., block number ranges). Numbers should be coded as numerals, not spelled out.	N	8	> 0
ZIPL	LeftZip	PostCode_L (C)	The five-digit zip code on the left side of the street when facing in the direction of ascending house numbers.	N	5	Valid NC zip

Suggested Header	Atttribute	NENA Attributes*	Description	Data Type+	Length	Values limited to "Null" or "unknown" allowed
ZIPR	RightZip	PostCode_R (C)	The five-digit zip code on the right side of the street when facing in the direction of ascending house numbers.	N	5	Valid NC zip
ZIP4L	LeftZipPlusFour		The additional four digits of the zip code on the left side of the street when facing in the direction of ascending house numbers.	N	4	Valid NC zip + four
ZIP4R	RightZipPlusFour		The additional four digits of the zip code on the left side of the street when facing in the direction of ascending house numbers.	N	4	Valid NC zip + four
SER_CLASS	ServiceClass	RoadClass (O)	The grouping of roads into classes or systems according to the character of service they are intended to provide.	N	1	1=Interstate (e.g., I40) 2=US Highways(e.g., US1) 3=NC Highways (e.g., NC50) 4=Secondary Roads (e.g., SR1001) 5=Local Roads (e.g. Main St) 6=Other (Trail?)
COUNTY	CountyName	County_L (M) County_R (M)	County name.	A/N	13	No domain limit
RD_ALIAS	RoadNameBodyAlias		A name by which the road is commonly known that is not the officially designated name as determined by the street data steward.	A/N	50	No domain limit
PREDIR_ALIAS	RoadPrefixAlias		The geographic direction of the road alias.	A	2	N, S, E, W, NE, NW, SE, SW
RDTYP_ALIAS	RoadTypeAlias		The street type of the road alias as referenced by the National Emergency Number Association (e.g., "RD," "ST")	A	4	http://www.nena9-1-1.org/9-1-1TechStandards/nena_recommended_standards.htm

Suggested Header	Atttribute	NENA Attributes*	Description	Data Type+	Length	Values limited to "Null" or "unknown" allowed
SUFDIR_ALIAS	RoadPostDirectionSuffixAlias		Additional information, typically geographic direction, that appears at the end of the alias road name.	A/N	2	No domain limit
RDTXT	MapTextRoadName		A concatenation of RoadPrefix, RoadNameBody, RoadType, and RoadPostDirectionSuffix with spaces separating the items. This should be formatted in mixed-case, appropriate for map labeling.	A/N	75	No domain limit
DATE	Date	DateUpdate (O)	Last date that a non-geometric change occurred to this record (example would be road name change, or address range change).	A/N	8	Valid dates.

* = M - Mandatory; O - Optional; C - Conditional

+ = A-Alpha; N-Numeric