Iowa Homeland Security and Emergency Management Department

Next Generation 9-1-1 GIS Standards

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The committee members that provided oversight and contributed to the development of these Iowa NG9-1-1 GIS Standards include:

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1.0 Executive Summary

As an integral part of the NG9-1-1 call process, Geographic Information Systems (GIS) map data is leveraged to route 9-1-1 calls to the correct Public Safety Answering Point (PSAP), to display a caller's location in tactical PSAP mapping systems, and to provide valuable life-saving information to emergency response personnel. Before a county or city's GIS data can take on these critical roles in the State of Iowa's Next Generation (NG) 9-1-1 system, certain elements must first be considered. What existing GIS data can be used? Does existing GIS data meet minimum accuracy requirements for NG9-1-1? What standard schema should be followed?

The GIS data created following the standards outlined in this document will serve the purpose of validating civic address locations, defining PSAP and Emergency Services boundaries for the routing and transfer of 9-1-1 calls, and defining the authoritative data sources at the local, regional, and State level. The resulting GIS data can then be coalesced and provisioned into the State of Iowa's NG9-1-1 system.

This standards document was a collaborative effort between the Iowa NG9-1-1 Advisory Committee, the Iowa Homeland Security and Emergency Management Department (HSEMD), and GeoComm, Inc. and will provide a solid foundation for NG9-1-1 GIS dataset development in the State of Iowa. At its core, this document follows the DRAFT NENA Standard for NG9-1-1 GIS Data Model, and as such, may be amended in the future as the DRAFT standards are finalized and made public.

1.1 Purpose

These standards will define a common data model and set minimum accuracy benchmarks to be attained before local data is integrated into a statewide NG9-1-1 GIS dataset. Existing and emerging industry standards at the national level were considered in the development of NG9-1-1 standards for the State of Iowa. The result is an authoritative document that can be used by local jurisdictions as a guide in updating their GIS data to meet NG9-1-1 standards.

Essentially, there are two types of GIS data that are required in the Emergency Call Routing Function (ECRF) and Location Validation Function (LVF) functional elements of a NG9-1-1 system, and they are emergency service area boundaries, and address location data. The layers and schema are subject to change based on functionality criteria of the ECRF and LVF elements. Additionally, this standard does not conform to the requirements of any specific vendor systems for CAD, CPE, and dispatch mapping applications. Any refinement required from an operational standpoint will need to be considered and a subsequent version of the standards published to meet those requirements.

The schema contained in these standards was developed to accommodate all address elements in the Presence Information Data Format – Location Object (PIDF-LO) as outlined in NENA 08-003 Detailed

Functional and Interface Specification for the NENA i3 Solution and are subject to change based on Emergency Services Routing Proxy (ESRP) requirements for the State of Iowa's NG9-1-1 system.

2.0 Background Terminology

The following terms are a subset of the terms defined in NENA 08-003 Detailed Functional and Interface Specification for the NENA i3 Solution. They serve to lay the base terminology incorporated into the GIS attribute definitions in subsequent sections of these standards.

TERM	DEFINITION
9-1-1 Authority	The local agency responsible for overall operation of, and data for the 9-1-1 system.
Agency Identifier	A domain name for an agency used as a globally unique identifier.
Border Control Function (BCF)	A BCF sits between external networks and the ESInet and between the ESInet and agency networks. All traffic from external networks transits a BCF.
Domain (or Domain Name)	The domain name (hostname) of an agency or element in an ESInet. See Domain Name System (DNS).
Element Identifier	A logical name used to represent physical implementation of a functional element or set of functional elements as a single addressable unit. The form of an element identifier is a hostname.
Emergency Call Routing Function (ECRF)	A functional element in an ESInet which is a LoST protocol server where location information (either civic address or geo-coordinates) and a Service URN serve as input to a mapping function that returns a URI used to route an emergency call toward the appropriate PSAP for the caller's location or towards a responder agency.
Emergency Services IP Network (ESInet)	An ESInet is a managed IP network that is used for emergency services communications, and which can be shared by all public safety agencies. It provides the IP transport infrastructure upon which independent application platforms and core functional processes can be deployed, including, but not restricted to, those necessary for providing NG9-1-1 services. ESInets may be constructed from a mix of dedicated and shared facilities. ESInets may be interconnected at local, regional, state, federal, national and international levels to form an IP-based inter-network (network of networks).
Emergency Services Routing Proxy (ESRP)	An i3 functional element which is a SIP proxy server that selects the next hop routing within the ESInet based on location and policy. There is an ESRP on the edge of the ESInet. There is usually an ESRP at the entrance to an NG9-1-1 PSAP. There may be one or more intermediate ESRPs between them.

TERM	DEFINITION
Location	In the context of location information to support IP-based emergency services: The physical position of an end-point expressed in either civic or geodetic form. A spot on the planet where something is; a particular place or position. Oxford Dictionary, Oxford University Press, 2009.
Location Information Server (LIS)	A Location Information Server (LIS) is a functional entity that provides locations of endpoints. A LIS can provide Location-by-Reference, or Location-by-Value, and, if the latter, in geo or civic forms. A LIS can be queried by an endpoint for its own location, or by another entity for the location of an endpoint. In either case, the LIS receives a unique identifier that represents the endpoint, for example an IP address, circuit-ID or MAC address, and returns the location (value or reference) associated with that identifier. The LIS is also the entity that provides the dereferencing service, exchanging a location reference for a location value.
Location to Service Translation (LoST) Protocol	A protocol that takes location information and a Service URN and returns a URI. Used generally for location-based call routing. In NG9-1-1, used as the protocol for the ECRF and LVF.
Location Validation Function (LVF)	Function used to validate civic address location information for storage in a LIS prior to a 9-1-1 call being placed.
Location URI	A URI which, when dereferenced, yields a location value in the form of a PIDF-LO. Location-by-reference in NG9-1-1 is represented by a Location URI.
Mapping	The act of determining a value in one domain from a value in another domain. For example, mapping a location to the URI of a PSAP that serves that location using the LoST protocol.
Next Hop	The next element in a routing path. For example, the next router in an IP network, or the next SIP proxy server in a SIP signaling path.
Originating Emergency Services Routing Proxy (ESRP)	The first routing element inside the ESInet. It receives calls from the BCF at the edge of the ESInet.
Policy Routing Function (PRF)	That functional component of an Emergency Services Routing Proxy that determines the next hop in the SIP signaling path using the policy of the nominal next element determined by querying the ECRF with the location of the caller.
Presence Information Data Format – Location Object (PIDF-LO)	Provides a flexible and versatile means to represent location information in a SIP header using an XML schema.
Request URI	That part of a SIP message that indicates where the call is being routed towards. SIP Proxy servers commonly change the Request ID (“retargeting”) to route a call towards the intended recipient.
ReverseGeocode	The process of converting a geo form of location (X,Y) to a civic (street address) form.

TERM	DEFINITION
Scheme	The part of a URI that indicates the protocol. For example, the scheme in the URI sip:john@example.com is "sip".
Service Boundary	A polygon in a GIS system, SIF, ECRF or other ESInet element that indicates the area a particular agency or element serves.
Session Initiation Protocol (SIP)	An IETF defined protocol (RFC3261) that defines a method for establishing multimedia sessions over the Internet. Used as the call signaling protocol in VoIP, i2 and i3.
Service Uniform Resource Name (Service URN)	A URN with "service" as the first component supplied as an input in a LoST request to an ECRF to indicate which service boundaries to consider when determining a response. A service URN is also used to mark a call as an emergency call.
SOS URN	A service URN starting with "urn:service:sos" which is used to mark calls as emergency calls as they traverse an IP network.
Subscriber Database (SDB)	A database operated by a carrier or other service provider which supplies the "Additional Call" data object. The SDB dereferences the URI passed in a Call-Info header and returns the AdditionalCall XML object.
Terminating ESRP	The last ESRP for a call in an ESInet, which typically chooses a queue of call takers to answer the call.
URI	See definition for "Location URI"
URN	See definition for "Service URN"
eXtensible Markup Language (XML)	An internet specification for web documents that enables tags to be used that provide functionality beyond that in Hyper Text Markup Language (HTML). Its reference is its ability to allow information of indeterminate length to be transmitted to a PSAP call taker or dispatcher versus the current restriction that requires information to fit the parameters of pre-defined fields.

3.0 Layer and Attribute Definitions

3.1 GIS Layer Categories

The categories defining GIS layer requirements in a NG9-1-1 system in this document fit into two categories, Required and Highly Recommended. These categories are defined below.

Required

The core elements of a NG9-1-1 call routing system where GIS data resides are the LVF and ECRF, which serve the purpose of first validating location information (LVF), and then determining the proper routing of the call (ECRF). The layers below are the minimum layers required to serve those purposes.

LAYER NAME	RESPONSIBLE PARTY
Road Centerline	Local Jurisdiction
Site/Structure Address Points	Local Jurisdiction
PSAP Boundaries	Local Jurisdiction
Emergency Service Boundaries (Fire, Law, EMS)	Local Jurisdiction
Authoritative Boundaries	State Level

Highly Recommended

To further refine the required GIS data, and provide even more accurate location validation and call routing, the following layers can be provisioned to the ECRF and LVF.

LAYER NAME	RESPONSIBLE PARTY
Road Name Alias Table	Local Jurisdiction
State Boundary	State Level
County Boundaries	State Level
Municipal Boundaries	Local Jurisdiction
Cell Sector Locations	Local Jurisdiction

3.2 GIS Attribute Categories

GIS layer attributes will fall into one of three categories for attribution purposes.

- M – Mandatory: indicates the field must be present, and appropriately populated in local datasets.
- C – Conditional: indicates the field must be present in local datasets, and if the attribute exists, the field must be populated. If the attribute does not exist, the field will be left blank.

  Example: PRD (Pre-Direction) is a Conditional field. In the address "1234 N Oak St", the pre-direction exists (N), therefore the field is populated.
- O – Optional: indicates the field can be present in local datasets, but its population is not required.

3.3 GIS Attribute Types

GIS layer attribute types are defined below

- A – Alphanumeric: any combination of upper and lower case letters A to Z and/or any number from 0 to 9

- N – Numeric: consisting of whole numbers only
- D – Date: Date and time using ISO 8601 compliant formats which are in the format of YYYY-MM-DDThh:mm:ss.sTZD

3.4 Supplemental information – Location Elements

NG9-1-1 systems are IP based networks and much more robust than existing landline, trunk-based E9-1-1 systems. The caller's voice along with location is transmitted through the network in what is called a Session Initiation Protocol (SIP) package. That SIP package contains the location information in the form of Presence Information Data Format – Location Object (PIDF-LO). Location elements are represented in the PIDF-LO parsed out into individual components framed by eXstensible Markup Language (XML) tags. This is the reason the schema for every layer to be provisioned into ECRF/LVF components includes the associated XML tags for those location elements.

Example:

<country>US</country>
<A1>IA</A1>
<A2>Polk</A2>
<A3>Johnston</A3>
<PRD>NW</PRD>
<RD>78TH</RD>
< STP>Avenue</STP>
<HNO>6100</HNO>

The NENA Next Generation 9-1-1 (NG9-1-1) United States Civic Location Data Exchange Format (CLDXF) Standard[1] was published on March 23, 2014. This standard defines the correlation of civic address location elements to their corresponding PIDF-LO XML tags, and was incorporated into the schema in this document for the State of Iowa. This ensures that the location data as validated in the GIS data correctly maps to the location elements carried along the data stream during a 9-1-1 call.

4.0 Spatial Requirements

4.1 Data Format

It is understood that Esri format is the most prevalent platform used by agencies for the maintenance of GIS data. However, in the interest of remaining vendor-neutral, there is no specific data format required for incorporation into the Iowa statewide GIS layers.

[1] https://www.nena.org/?NG911CLDXF

4.2 Coordinate Reference System and Datum

The Detailed Functional and Interface Specifications for the NENA i3 Solution (NENA 08-003)[2] describe NENA's specifications for an NG9-1-1 i3 solution. This includes requirements around GIS data coordinate reference system and datum and is identified as World Geodetic System of 1984 (WGS84). This is the required coordinate reference system for data that resides within the ECRF. Data can be maintained in an alternate coordinate reference system, however a transformation will need to be completed to WGS84 before the data is provisioned to the ECRF.

EPSG:4326 WGS 84 / Latlong
Projection: Geographic, Plate Carrée, Equidistant Cylindrical, Equirectangular
Latitude of the origin: 0°
Longitude of the origin 0°
Scaling factor: 1
False eastings: 0°
False northings: 0°
Ellipsoid: WGS84
Horizontal Datum WGS84 Vertical Datum: WGS84 Geoid, which is equivalent to Local Mean Sea Level (MSL)
Units: decimal degrees
Global extent: -180, -90, 180, 90

[2] NENA 08-003: http://www.nena.org/?page=i3_Stage3

5.0 Required Layer Category

5.1 Road Centerline

The baseline layer needed for validation of civic address location information is an address ranged road centerline. This layer's attribute structure is what will absorb the content and purpose currently served by the MSAG in E9-1-1 systems. ESN and MSAG specific fields will be maintained as long as a legacy system interface is needed, and are expected to be deleted from the data model in the future as a fully realized NG9-1-1 i3 system is put in place.

Road Centerline Creation

Road centerlines represent all public and addressed private streets. Road names must conform to the legal names as assigned by the local addressing authority. All centerline attributes should be accurate, complete, and standardized to the format in this document. All abbreviations of Street Prefixes and Suffixes should be incorporated according to NENA Standards. Road centerlines must match the corrected MSAG data to a 98% or higher rate, and all related NENA standards shall be met or exceeded.

Road centerlines are drawn in segments. Segments shall be broken and snapped to the endpoint of the adjoining segments in the following circumstances:

- All line segment intersections, even if they do not represent a road intersection (Example: Overpasses and the roads they route over)
- At State, County, Municipal, ESB and ESZ boundaries
- At any change in the primary road name
- Data stewards may include any additional breaks in the segments that they require, as long as each segment is snapped to the endpoint of the adjoining segments and attributes are properly populated.

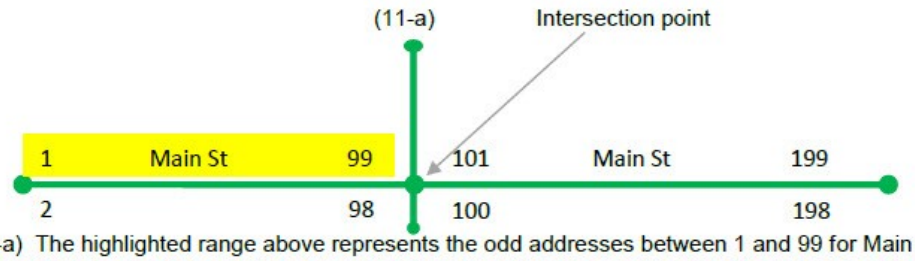
Placement of centerlines shall fall within the visible boundary of the road surface in the best available orthoimagery. It is recommended they fall with 10' of the center of the visible road surface in the best available orthoimagery.

Fails to meet standard

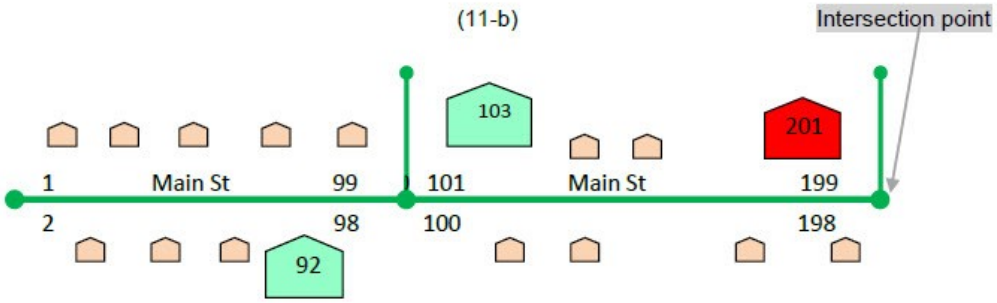
Meets standard

Meets recommendation

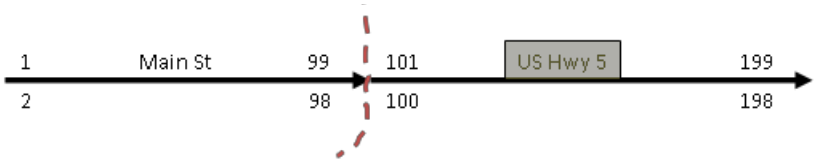
Centerlines and Range placement



(11-a) The highlighted range above represents the odd addresses between 1 and 99 for Main St. The address range should be numbered Low address to High address, following the direction of the centerline.



(11-b) All address point addresses along a section of centerline should fall within the range of that particular centerline segment. The address point for 201 Main St. is not included in the range, the point should be verified and either centerline range or address point location should be modified.



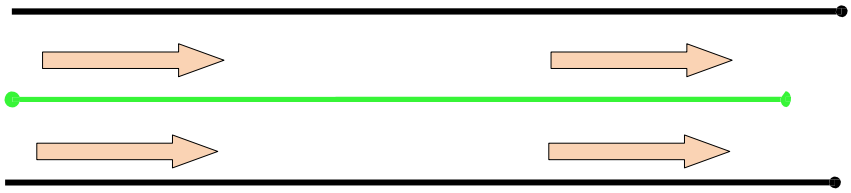
(11-c)

(11-c) - Street names can change. Main St is located inside the city limits, but when it leaves the city, the name

changes to US Hwy 5. The address range data may change with the new name, but not always.

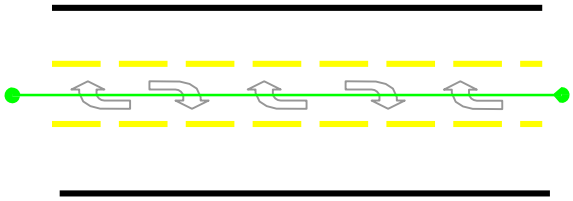
One way streets

Follow the center of the lane or lanes with a single line segment. The segment shall be drawn in the direction of low address to high address, not the direction of travel. Populate the ONEWAY field with FT or TF depending on which is appropriate.



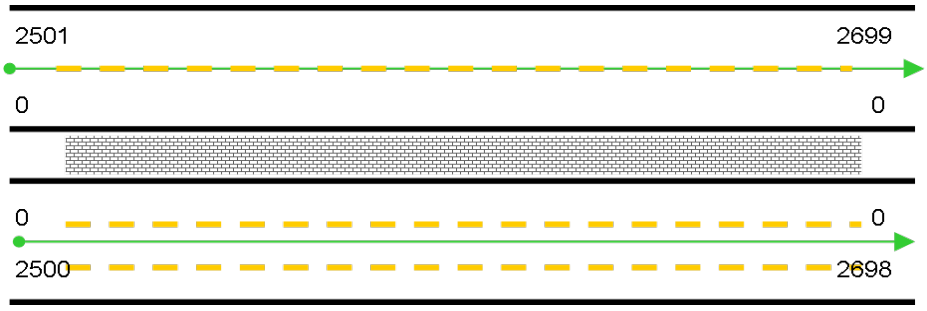
Turning Lanes

Follow the center of the turning lane, when there are no physical or legal barriers between lanes, one line segment is sufficient.

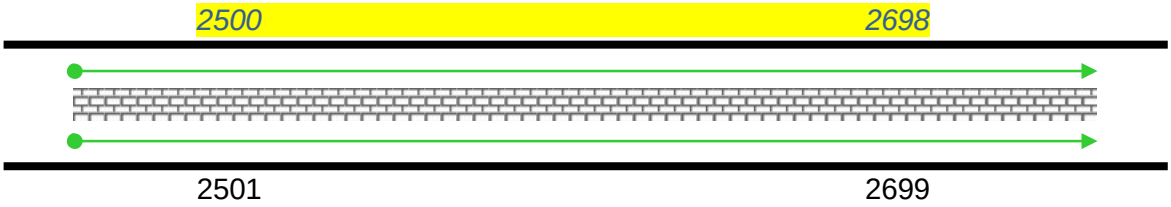


Bi-directional traffic lanes

Two lanes on one side of the divider, three lanes on the other side results in one centerline coinciding with the central painted line on one side, and one centerline in the middle lane on the opposite side of the barrier. Only one side of each centerline shall be addressed for this type of road.



Dual Carriageway



This is an example of a Dual Carriageway. Only one side of the centerline shall be addressed for this type of road centerline.

Road shall be represented as dual carriageways if the median meets both the type and length specifications below:

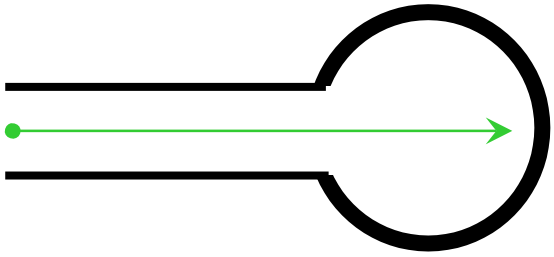
Median Type: Any physical barrier and any painted barrier greater than 4' wide.

Median Length: Divides the road for 1/10th of one mile or more in urban areas and 3/10th of one mile or more in rural areas.

For a road that divides temporarily to go around small reserves or other small obstructions, as in the example image below, a single centerline can be used.

Cul-de-sac

Cul-de-sac roads shall be represented by a single line extended to center or edge of the pavement as shown below. If the drive lane circles a small reserve or other central obstruction, the line can follow the center of the drive lane at the Data Steward's discretion.



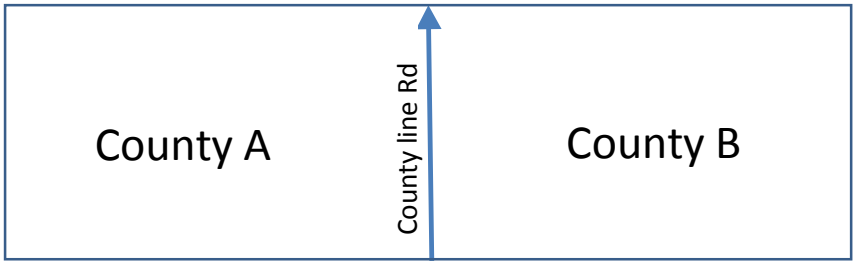
Address Ranges along jurisdictional boundaries

When a road segment forms the boundary between PSAP service areas, the data steward shall include only those address ranges for which they are responsible. For example, if a road forms part of the boundary between two counties. County A assigns addresses along the west side of the road, and County B assigns addresses along the east side. County A data should show zeros for the address ranges on the east side, and County B data should show zeros for the address ranges on the west side.

Border Roads

Roads that form the border between Authoritative Boundaries such as counties will be present in the data of more than one agency. Each agency is responsible for the attributes on the side of the line segment associated with addresses in their jurisdiction. Values for attributes on the side of the line segment associated with addresses that are not in their jurisdiction will be dropped in aggregation.

In the example below, the left side attributes are the responsibility of County A and the right side attributes are the responsibility of County B. County A and B may or may not have the values of the other county in their database. It is the counties preference to attribute their database or to leave it blank.



ROAD CENTERLINES					
FIELD	XML	M/C/O	TYPE	WIDTH	DESCRIPTION
Source	DataSource	M	A	75	The name of the source 9-1-1 Authority that last updated the record. Example: SECC911.IA.us.gov
Updated	LastUpdate	M	D	26	Date of last update using ISO 8601 format. Example: 2010-10-12T16:34:44-6.00
Effective	EffectiveDate	O	D	26	Date the new record information goes into effect using ISO 8601 format. Example: 2013-01-15T01:00:00-6.00
Expire	ExpirationDate	O	D	26	Date when the information in the record is no longer considered valid. Example: 2020-05-25T10:23:16-6.00
RoadCL_UID	RoadUnqID	M	A	100	Combination of the static unique numerical ID and the source 9-1-1 Authority ID to create a unique identifier within an aggregated set of data. Example: 1215@stormlake.ia.us
Country_L	CountryLeft	M	A	2	Two-letter Country name as defined by ISO 3166-1. English country alpha-2 code elements in capital ASCII letters. Example: US, CA, MX
Country_R	CountryRight	M	A	2	Two-letter Country name as defined by ISO 3166-1. English country alpha-2 code elements in capital ASCII letters. Example: US, CA, MX
State_L	StateLeft	M	A	2	Two-letter State name as defined by ISO 3166-1. English country alpha-2 code elements in capital ASCII letters. Example: IA (Iowa), MN (Minnesota)
State_R	StateRight	M	A	2	Two-letter State abbreviation defined by USPS Publication 28, on the Right side of the road segment. Example: IA (Iowa), MN (Minnesota)

ROAD CENTERLINES					
FIELD	XML	M/C/O	TYPE	WIDTH	DESCRIPTION
County_L	CountyLeft	M	A	40	County Name designated on the Left side of the road segment, completely spelled out, as defined in INCITS 38:2009 Example: Henry County
County_R	CountyRight	M	A	40	County Name designated on the Right side of the road segment, completely spelled out, as defined in INCITS 38:2009 Example: Henry County
IncMuni_L	IncorporatedMunicipalityLeft	M	A	100	Incorporated municipality name where the address is located, on the Left side of the road segment. If a municipality name does not exist, populate with "Unincorporated". Example: Des Moines, Sioux City
IncMuni_R	IncorporatedMunicipalityRight	M	A	100	Incorporated municipality name where the address is located, on the Right side of the road segment. If a municipality name does not exist, populate with "Unincorporated". Example: Des Moines, Sioux City
UnincComm_L	UnincorporatedCommunityLeft	C	A	100	Unincorporated Community name where the address is located, on the Left side of the road segment, either within an incorporated municipality or within an unincorporated portion of a county, or both. Example: Amana Colonies
UnincComm_R	UnincorporatedCommunityRight	C	A	100	Unincorporated Community name where the address is located, on the Right side of the road segment, either within an incorporated municipality or within an unincorporated portion of a county, or both. Example: Amana Colonies

ROAD CENTERLINES					
FIELD	XML	M/C/O	TYPE	WIDTH	DESCRIPTION
NbrhdCom_L	NeighborhoodCommunityLeft	O	A	100	Unincorporated Neighborhood name where the address is located, on the Left side of the road segment, either within an incorporated municipality or within an unincorporated portion of a county, or both. Example: Woodland Heights
NbrhdCom_R	NeighborhoodCommunityRight	O	A	100	Unincorporated Neighborhood name where the address is located, on the Right side of the road segment, either within an incorporated municipality or within an unincorporated portion of a county, or both. Example: Woodland Heights
AdRngPre_L	LeftAddressNumberPrefix	C	A	15	The first portion of a hyphenated address number on the left side of the road segment. Example: "99-" in 99-205 Red Oak Rd
AdRngPre_R	RightAddressNumberPrefix	C	A	15	The first portion of a hyphenated address number on the right side of the road segment. Example: "3NW-" in 3NW-1612 County Line Rd
FromAddr_L	LeftFromAddress	M	N	6	The beginning range on the Left side of the road segment at the FROM node. NOTE: This address can be higher than the "Left TO Address"
ToAddr_L	LeftToAddress	M	N	6	The end range on the Left side of the road segment at the TO node. NOTE: This address can be lower than the "Left FROM Address"
FromAddr_R	RightFromAddress	M	N	6	The address on the Right side of the road segment at the FROM node. NOTE: This address can be higher than the "Right TO Address"

ROAD CENTERLINES					
FIELD	XML	M/C/O	TYPE	WIDTH	DESCRIPTION
ToAddr_R	RightToAddress	M	N	6	The address on the Right side of the road segment at the TO node. NOTE: This address can be lower than the "Right FROM Address"
Parity_L	ParityLeft	M	A	1	Parity designation for Address Range on the Left side of the road segment. Example: E, O, B, Z for Even, Odd, Both, or Zero (if the range is 0 to 0).
Parity_R	ParityRight	M	A	1	Parity designation for Address Range on the Right side of the road segment. Example: E, O, B, Z for Even, Odd, Both, or Zero (if the range is 0 to 0).
PostComm_L	PostalCommunityNameLeft	C	A	40	The city name for the ZIP code where the address is located as defined in the USPS City State file, on the Left side of the road segment. Example: Des Moines for Zip Codes: 50314 and 50318
PostComm_R	PostalCommunityNameRight	C	A	40	The city name for the ZIP code where the address is located as defined in the USPS City State file, on the Right side of the road segment. Example: Des Moines for Zip Codes: 50314 and 50318
PostCode_L	PostalCodeLeft	C	A	7	The 5-digit code where the address is located that identifies the individual USPS Post Office or metropolitan area delivery station associated with an address, on the Left side of the road segment. ZIP plus 4 should NOT be included. Example: 50130

ROAD CENTERLINES					
FIELD	XML	M/C/O	TYPE	WIDTH	DESCRIPTION
PostCode_R	PostalCodeRight	C	A	7	The 5-digit code where the address is located that identifies the individual USPS Post Office or metropolitan area delivery station associated with an address, on the Right side of the road segment. ZIP plus 4 should NOT be included. Example: 50130
ESN_L	ESNLeft	M	A	5	The Emergency Service Number where the address is located as identified by the MSAG, on the Left side of the road segment. Example: 4216
ESN_R	ESNRight	M	A	5	The Emergency Service Number where the address is located as identified by the MSAG, on the Right side of the road segment. Example: 4216
MSAGComm_L	MSAGCommunityNameLeft	M	A	40	The valid service community name where the address is located, on the Left side of the road segment as identified by the MSAG. Example: Grafton
MSAGComm_R	MSAGCommunityNameRight	M	A	40	The valid service community name where the address is located, on the Right side of the road segment as identified by the MSAG. Example: Grafton
StN_PreMod	StreetNamePreModifier	O	A	25	Pre-modifier. A word or phrase that precedes the Street Name element but is separated from it by a Street Name Pre Type or a Street Name Pre Directional or both. Example: Access, Alternate, Business, Bypass, Connector, Extended, Extension, Loop, Old, Overpass, Private, Public, Ramp, Scenic, Spur, Underpass.

ROAD CENTERLINES					
FIELD	XML	M/C/O	TYPE	WIDTH	DESCRIPTION
StN_PreDir	StreetNamePreDirectional	C	A	2	A word preceding the Street Name that indicates the direction taken by the street from an arbitrary starting point or line, or the sector where it is located. Example: N, S, E, W, NE, NW, SE, SW
StN_PreTyp	StreetNamePreType	C	A	20	A word or phrase that precedes the Street Name element and identifies a type of thoroughfare in a complete street name. Must always be spelled out. Example: "County Road" in County Road 20, "Interstate" in Interstate 34
StN_PreSep	StreetNameTypeSeparator	C	A	15	A prepositional word or phrase between the Street Name Pre Type and the Street Name Example: "of the" in Avenue of the Saints
StreetName	StreetName	M	A	60	The element of the complete street name that identifies the particular street (as opposed to any street types, directionals, and modifiers) Example: "Oak" in South Oak Street
StN_PosType	StreetNamePostType	C	A	4	A word or phrase that follows the Street Name element and identifies a type of thoroughfare in a complete street name. See USPS Publication 28 Appendix C1 for valid entries Example: "Street" in South Oak Street
StN_PosDir	StreetNamePostDirectional	C	A	2	A word following the Street Name that indicates the direction taken by the street from an arbitrary starting point or line, or the sector where it is located. Example: N, S, E, W, NE, NW, SE, SW

ROAD CENTERLINES					
FIELD	XML	M/C/O	TYPE	WIDTH	DESCRIPTION
StN_PosMod	StreetNamePostModifier	C	A	12	A word or phrase that follows and modifies the Street Name, but is separated from it by a Street Name Post Type or a Street Name Post Directional or both. Example: Access, Alternate, Business, Bypass, Connector, Extended, Extension, Loop, Overpass, Private, Public, Ramp, Scenic, Spur, Underpass
SpeedLimit	SpeedLimit	O	N	3	Posted Speed in mph
OneWay	OneWay	O	A	2	One-way direction of travel. **B** or **Blank** – travel in both directions allowed **FT** – One-way traveling from FROM node to TO node **TF** – One way traveling from TO node to FROM Node
RoadClass	RoadClass	O	A	15	**Primary** **Secondary** **Local** (City, Neighborhood, or Rural Road) **Ramp** **Service** (usually along a limited access highway) **Vehicular Trail** (4WD, snowmobile) **Walkway** (Pedestrian Trail, Boardwalk) **Alley** **Private** (service vehicles, logging, oil fields, ranches, etc.) **Parking Lot** **Trail** (Ski, Bike, Walking / Hiking Trail) **Other**

ROAD CENTERLINES					
FIELD	XML	M/C/O	TYPE	WIDTH	DESCRIPTION
FS_PreDir	FS_StreetNamePreDirectional	O	A	9	Fully Spelled out StN_PreDir
FS_PosType	FS_StreetNamePostType	O	A	10	Fully Spelled out StN_PosType
FS_PosDir	FS_StreetNamePostDirectional	O	A	9	Fully Spelled out StN_PosDir
GC_Exception	GC_Exception	C	A	75	Feature Exception codes Codes: See the IA GIS System User Guide for code definitions

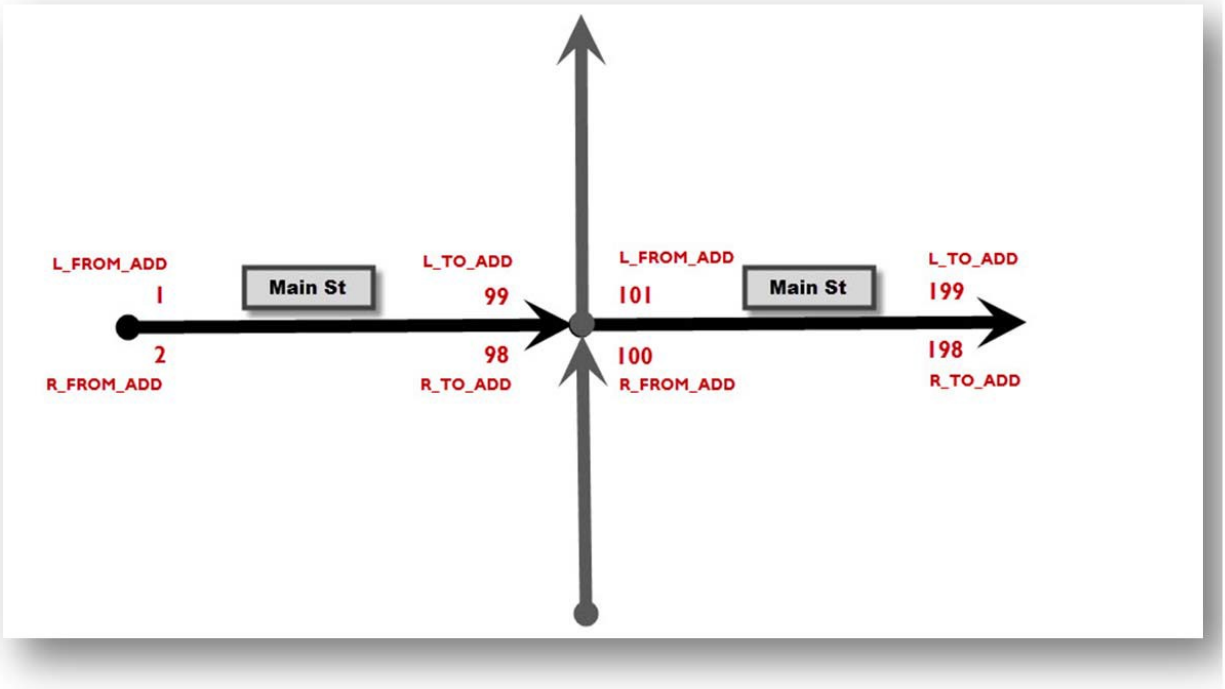


Figure 1: This graphic depicts the explanation of "From" and "To" address ranges described in the attribute descriptions above for L_FROM_ADD, L_TO_ADD, R_FROM_ADD, and R_TO_ADD.

5.2 Site/Structure Address Points

Site/Structure Address Points provide a more accurate representation of the true location of a civic address. At times, depending on the point placement, address points located on a structure can fall in a different ESN or Community than interpolated location off the address ranged road centerline for that address. For this reason, Address Points are a highly recommended layer to enhance the location validation accuracy of a NG9-1-1 system.

Link to NENA 9-1-1 Site/ Structure Address Point GIS Data for 9-1-1

http://dev.nena.org/apps/group_public/document.php?document_id=6217

Placement Properties

Address points represent all structures and sites with as a unique assigned street address. There should not be any duplicate address points. There shall be a point on every addressable single-unit building, on living unit/occupancy of every multi-unit building or complex, and a point for every telephone service address in the TN listing.

For some structures and sites, an access point is not always obvious. Long driveways in rural areas are an example of this. It is recommended that data stewards maintain subordinate points for those access locations.

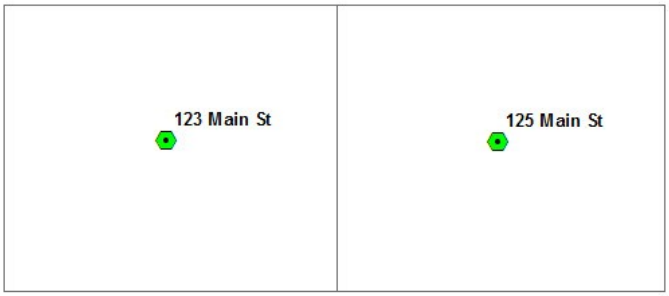
Primary Point Placement

The primary address point shall be placed on the primary structure or site, if no structure exists. This is a requirement for point placement, not address assignment. It is common for a rural address to be assigned based on the location of the driveway as it joins to the road, which is appropriate. However, it is recommended that the address point shall be placed on the structure itself.

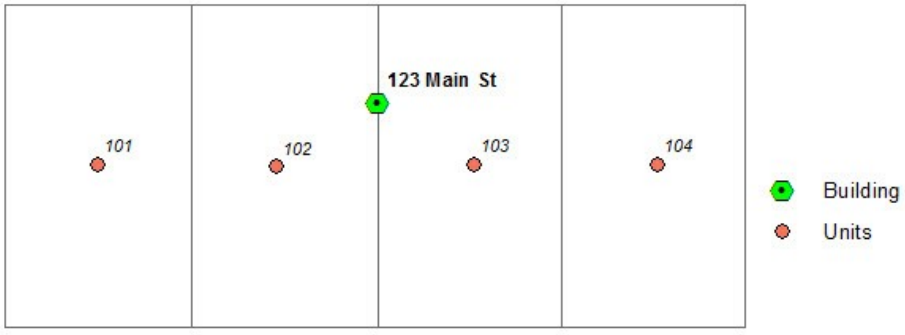
Multiple Address Structures

Buildings or complexes with a street address and individual units bearing unit identifiers (apartment numbers, building numbers, etc.), shall have an address point for each unit. Address points for individual units shall be placed on the structure, in the appropriate location of the unit within the building.

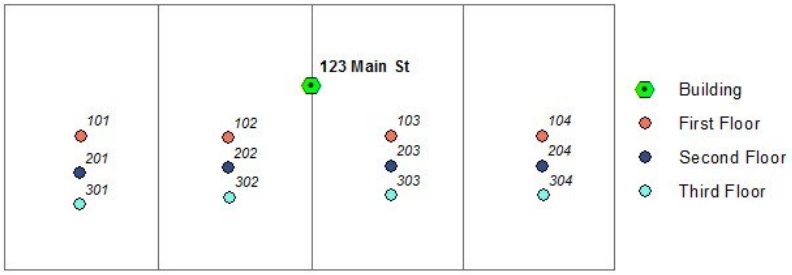
Point placement on Duplex



Point placement on single story with multiple units (ex. Apartment numbers 101-104)



Point placement on two or more stories with multiple units



Address Point Requirements Summary

Address points shall be continually updated and meet or exceed the NENA standards. Address point shall, at a minimum, represent all public and private addressable structures, all living units/occupancies in multi-unit buildings and every telephone service address in the TN listing.

SITE/STRUCTURE ADDRESS POINTS					
FIELD	**XML**	**M/C/O**	**TYPE**	**WIDTH**	**DESCRIPTION**
Source	Source	M	A	75	The name of the source 9-1-1 Authority that last updated the record.
					Example: SECC911.IA.us.gov
Updated	LastUpdate	M	D	26	Date of last update using ISO 8601 format.
					Example: 2010-10-12T16:34:44-6.00
Effective	EffectiveDate	O	D	26	Date the new record information goes into effect using ISO 8601 format.
					Example: 2013-01-15T01:00:00-6.00
Expire	ExpirationDate	O	D	26	Date when the information in the record is no longer considered valid.
					Example: 2020-05-25T10:23:16-6.00
Site_UID	SiteUnqID	M	A	100	Combination of the static unique numerical point ID and the source 9-1-1 Authority ID to create a unique identifier within an aggregated set of data.
					Example: 23548@johnston.ia.us
Country	Country	M	A	2	Two-letter Country name as defined by ISO 3166-1. English country alpha-2 code elements in Capital ASCII letters.
					Example: US, CA, MX
State	State	M	A	2	Two-letter State name as defined by ISO 3166-1. English country alpha-2 code elements in Capital ASCII letters.
					Example: IA (Iowa), MN (Minnesota)

SITE/STRUCTURE ADDRESS POINTS					
FIELD	**XML**	**M/C/O**	**TYPE**	**WIDTH**	**DESCRIPTION**
County	County	M	A	40	County Name in which the point is located, completely spelled out, as defined in INCITS 38:2009
					Example: Henry County
AddDataURI	AdditionalDataURI	C	A	255	URI for additional data associated with the site/structure address point.
					Example: Blueprints, contact info, floor plans.
Inc_Muni	IncorporatedMunicipality	M	A	100	Incorporated municipality name where the address is located. If a municipality name does not exist, populate with "Unincorporated".
					Example: Des Moines, Sioux City
Uninc_Comm	UnicorporatedCommunity	O	A	100	Unincorporated Community name where the address is located, either within an incorporated municipality or within an unincorporated portion of a county, or both.
					Example: Amana Colonies
Nbrhd_Comm	NeighborhoodCommunity	O	A	100	Unincorporated Neighborhood name where the address is located, either within an incorporated municipality or within an unincorporated portion of a county, or both.
					Example: Lake District
AddNum_Pre	AddressNumberPrefix	O	A	15	An extension of the address number that precedes it and further identifies a location along a thoroughfare or within a defined area.
					Example: "B" in B350 Greenberg Pl
Add_Number	AddressNumber	C	N	6	The numeric identifier of a location along a thoroughfare or within a defined community.
					Example: "101" in 101 Main St

SITE/STRUCTURE ADDRESS POINTS					
FIELD	**XML**	**M/C/O**	**TYPE**	**WIDTH**	**DESCRIPTION**
AddNum_Suf	AddressNumberSuffix	C	A	15	An extension of the address number that precedes it and further identifies a location along a thoroughfare or within a defined area.
					Example: "B" in B350 Greenberg Pl
StN_PreMod	StreetNumberPreModifier	O	A	25	A word or phrase that precedes the Street Name element but is separated from it by a Street Name Pre Type or a Street Name Pre Directional or both.
					Example: Access, Alternate, Business, Bypass, Connector, Extended, Extension, Loop, Old, Overpass, Private, Public, Ramp, Scenic, Spur, Underpass.
StN_PreDir	StreetNumberPreDirectional	C	A	2	A word preceding the Street Name that indicates the direction taken by the street from an arbitrary starting point or line, or the sector where it is located.
					Example: N, S, E, W, NE, NW, SE, SW
StN_PreTyp	StreetNumberPreType	O	A	20	A word or phrase that precedes the Street Name element and identifies a type of thoroughfare in a complete street name. Must always be spelled out.
					Example: "County Road" in County Road 20, "Interstate" in Interstate 34
StN_PreSep	StreetNumberPreTypeSeparator	C	A	10	A prepositional word or phrase between the Street Name Pre Type and the Street Name
					Example: "of the" in Avenue of the Saints
StreetName	StreetName	C	A	60	The element of the complete street name that identifies the particular street (as opposed to any street types, directionals, and modifiers)
					Example: "Oak" in South Oak Street

SITE/STRUCTURE ADDRESS POINTS					
FIELD	**XML**	**M/C/O**	**TYPE**	**WIDTH**	**DESCRIPTION**
StN_PosType	StreetNamePostType	C	A	4	A word or phrase that follows the Street Name element and identifies a type of thoroughfare in a complete street name. See USPS Publication 28 Appendix C1 for valid entries
					Example: "Street" in South Oak Street
StN_PosDir	StreetNamePostDirectional	C	A	2	A word following the Street Name that indicates the direction taken by the street from an arbitrary starting point or line, or the sector where it is located.
					Example: N, S, E, W, NE, NW, SE, SW
StN_PosMod	StreetNamePostModifier	C	A	12	A word or phrase that follows and modifies the Street Name, but is separated from it by a Street Name Post Type or a Street Name Post Directional or both.
					Example: Access, Alternate, Business, Bypass, Connector, Extended, Extension, Loop, Overpass, Private, Public, Ramp, Scenic, Spur, Underpass
ESN	ESN	C	A	5	The Emergency Service Number where the address is located as identified by the MSAG.
					Example:
MSAG_Comm	MSAGCommunityName	C	A	30	The valid service community name where the address is located, as identified by the MSAG.
					Example:
Post_Comm	PostalCommunityName	C	A	40	The city name for the ZIP code where the address is located as defined in the USPS City State file.
					Example: Clear Lake
Post_Code	PostalCode	C	A	7	The 5-digit code where the address is located that identifies the individual USPS Post Office or metropolitan area delivery station associated with an address.
					Example: 50427
Post_Code4	PostalCodePlus4	O	A	4	The ZIP plus 4 code (without the dash)
					Example: 1234

SITE/STRUCTURE ADDRESS POINTS					
FIELD	**XML**	**M/C/O**	**TYPE**	**WIDTH**	**DESCRIPTION**
Building	Building	O	A	75	One among a group of buildings that have the same address number and complete street name. Example: "Building A" in 456 Oak Street, Building A, Apt 206 "Terminal 3" in John F. Kennedy International Airport, Terminal 2
Floor	Floor	O	A	75	A floor, story, or level within a building. "Floor 5" in 800 Jefferson Street, Floor 5 "5th Floor" in 800 Jefferson Street, 5th Floor "Mezzanine" in 800 Jefferson Street, Mezzanine
Unit	Unit	O	A	75	A group or suite of rooms within a building that are under common ownership or tenancy, typically having a common primary entrance. Example: "Apartment 12" in 541 Arbor Avenue, Apartment 12 "Suite 3103" in 4300 Flamingo Street, Suite 3102
Room	Room	O	A	75	A single room within a building. Example: "Room 450F" in 1440 Market St, Room 450F "Mississippi Room" in 565 Jefferson Street, Mississippi Room "Lobby" in 1200 Main St, Lobby
Seat	Seat	O	A	75	A place where a person might sit within a building. Example: "Cubicle 23" in 2500 Seventh Street, Room 105, Cubicle 23 "Registration Desk" in Grand Hotel, 1101 Madison Street, Registration Desk

SITE/STRUCTURE ADDRESS POINTS					
FIELD	**XML**	**M/C/**	**TYPE**	**WIDTH**	**DESCRIPTION**
Addtl_Loc	AdditionalLocationInformation	O	A	255	Additional location information, which is not a building, floor, unit, room or seat. Example: SW corner of warehouse
LandmkName	CompleteLandmarkName	O	A	150	The name by which a prominent feature is publicly known Example: Central High School, Crossroads Mall, Empire State Building
Milepost	Milepost	C	A	150	A distance travelled along a route such as a road or highway, typically indicated by a milepost sign. There is typically a post or other marker indicating the distance in miles/kilometers from or to a given point Example: Mile Marker 185.7
Place_Type	PlaceType	C	A	50	Type of feature identified by the address Example: school, arena, bank, hospital
Long	Long	O	F	12	Value represented in decimal degrees east or west of the prime meridian.
Lat	Lat	O	F	11	Value represented in decimal degrees north or south of the equator
Elev	Elev	O	N	6	Height above Mean Sea Level in meters
FS_PreDir	FS_StreetNamePreDirectional	O	A	9	Fully Spelled out StN_PreDir
FS_PosType	FS_StreetNamePostType	O	A	10	Fully Spelled out StN_PosType
FS_PosDir	FS_StreetNamePostDirectional	O	A	9	Fully Spelled out StN_PosDir
GC_Exception	GC_Exception	C	A	75	Feature Exception codes Codes: See the IA GIS System User Guide for code definitions

5.3 PSAP Boundaries

The PSAP boundary is the most critical layer for the initial routing of 9-1-1 calls to the correct PSAP in a NG9-1-1 system.

PSAP BOUNDARIES					
FIELD	**XML**	**M/C/O**	**TYPE**	**WIDTH**	**DESCRIPTION**
Source	SourceofData	M	A	75	The name of the source 9-1-1 Authority that last updated the record. Example: SECC911.IA.us.gov
Updated	DateUpdate	M	D	26	Date of last update using ISO 8601 format. Example: 2010-10-12T16:34:44-6.00
Effective	EffectiveDate	O	D	26	Date the new record information goes into effect using ISO 8601 format. Example: 2013-01-15T01:00:00-6.00
Expire	ExpirationDate	O	D	26	Date when the information in the record is no longer considered valid. Example: 2020-05-25T10:23:16-6.00
ES_UID	ESUnqID	M	A	100	Combination of the Emergency Service type, the static unique numerical ID, and the source 9-1-1 Authority ID to create a unique identifier within an aggregated set of data. Examples: PSAP_21@SECC911.IA.us.gov EMS_75@SECC911.IA.us.gov FIRE_88@SECC911.IA.us.gov LAW_101@SECC911.IA.us.gov
Country	Country	M	A	2	Two-letter Country name as defined by ISO 3166-1. English country alpha-2 code elements in capital ASCII letters. Example: US, CA, MX
State	State	M	A	2	Two-letter Country name as defined by ISO 3166-1. English country alpha-2 code elements in capital ASCII letters. Example: IA (Iowa), MN (Minnesota)
County	County	M	A	40	County Name as defined in INCITS 38:2009. Completely spelled out. Example: Henry County

PSAP BOUNDARIES					
FIELD	**XML**	**M/C/O**	**TYPE**	**WIDTH**	**DESCRIPTION**
Agency_ID	AgencyId	M	A	100	A domain name which is used to uniquely identify any agency. Example: psap.clearlake.IA.us
Route	Route	M	A	255	Uniform Resource Identifier (URI) used for call routing following the syntax format described in IETF RFC 3986. Must be unique in an aggregated set of data. Example: sip:sos.law@city.eoc.ia.us
ServiceURN	ServiceURN	M	A	50	The Uniform Resource Name (URN) for the Emergency Service requested Examples: urn:service:sos for 9-1-1 PSAP urn:service:sos.ambulance for an ambulance service
ServiceNUM	ServiceNumber	O	A	15	The numbers that would be dialed on a 12 digit keypad to reach the emergency service appropriate for the location. Examples: 911 to reach a PSAP (in PSAP boundary layer)
Avcard_URI	AgencyVCardURI	M	A	255	URI for the vCARD of contact information. Example: http://tools.ietf.org/html/rfc6349
DsplayName	DisplayName	M	A	60	Display Name of the Service Example: Waterloo PD
GC_Exception	GC_Exception	C	A	75	Feature Exception codes Codes: See the IA GIS System User Guide for code definitions

5.4 Emergency Services Boundaries

For the transfer of calls based on the type of service requested, individual Emergency Service boundary layers are needed for Fire, Law, and EMS. The schema below is meant to serve as a template for the creation of all three of these layers, Fire, Law, and EMS.

EMERGENCY SERVICES BOUNDARIES					
FIELD	**XML**	**M/C/O**	**TYPE**	**WIDTH**	**DESCRIPTION**
Source	SourceOfData	M	A	75	The name of the source 9-1-1 Authority that last updated the record. Example: SECC911.IA.us.gov
Updated	DateUpdate	M	D	26	Date of last update using ISO 8601 format. Example: 2010-10-12T16:34:44-6.00
Effective	EffectiveDate	O	D	26	Date the new record information goes into effect using ISO 8601 format. Example: 2013-01-15T01:00:00-6.00
Expire	ExpirationDate	O	D	26	Date when the information in the record is no longer considered valid. Example: 2020-05-25T10:23:16-6.00
ES_UID	ESUnqID	M	A	100	Combination of the Emergency Service type, the static unique numerical ID, and the source 9-1-1 Authority ID to create a unique identifier within an aggregated set of data. Examples: PSAP_21@SECC911.IA.us.gov EMS_75@SECC911.IA.us.gov FIRE_88@SECC911.IA.us.gov LAW_101@SECC911.IA.us.gov
Country	Country	M	A	2	Two-letter Country name as defined by ISO 3166-1. English country alpha-2 code elements in capital ASCII letters. Example: US, CA, MX

EMERGENCY SERVICES BOUNDARIES					
FIELD	**XML**	**M/C/O**	**TYPE**	**WIDTH**	**DESCRIPTION**
State	State	M	A	2	Two-letter Country name as defined by ISO 3166-1. English country alpha-2 code elements in capital ASCII letters. Example: IA (Iowa), MN (Minnesota)
County	County	M	A	40	County Name as defined in INCITS 38:2009. Completely spelled out. Example: Henry County
Agency_ID	AgencyID	M	A	100	A domain name which is used to uniquely identify any agency. Example: psap.clearlake.IA.us
Route	Route	M	A	255	Uniform Resource Identifier (URI) used for call routing following the syntax format described in IETF RFC 3986. Must be unique in an aggregated set of data. Example: sip:sos.law@city.eoc.ia.us
ServiceURN	ServiceURN	M	A	50	The Uniform Resource Name (URN) for the Emergency Service requested Examples: urn:service:sos for 9-1-1 PSAP urn:service:sos.ambulance for an ambulance service
ServiceNum	ServiceNumber	O	A	15	The numbers that would be dialed on a 12 digit keypad to reach the emergency service appropriate for the location. Examples: 911 to reach a PSAP (in PSAP boundary layer) (515) 283-4824 to reach Des Moines Police Department (in Law layer)
Avcard_URI	AgencyVCardURI	M	A	255	URI for the vCARD of contact information. Example: http://tools.ietf.org/html/rfc6349
DsplayName	DisplayName	M	A	60	Display Name of the Service Example: Waterloo PD
GC_Exception	GC_Exception	C	A	75	Feature Exception codes Codes: See the IA GIS System User Guide for code definitions

5.5 Authoritative Boundary

GIS data is expected to be provided from a variety of sources for coalescing into the overall statewide layers. The authoritative boundary is intended to represent the boundary extent (city, county, region) for which the GIS data is provided. For example, if a city is providing their data directly, the authoritative boundary is a single polygon for that city boundary. If that city provides their data to the county, and thus the county is the authoritative source of data into the statewide layers, then the county boundary becomes the single polygon for the county as the authoritative source. The same holds true if multiple counties supply data to a regional entity. Thus each authoritative source provides a single polygon boundary, and those boundaries become coalesced at the State level where no overlaps or gaps are allowed. This layer will be used in the reporting of discrepancies back to the source for remediation.

AUTHORITATIVE BOUNDARY					
FIELD	**XML**	**M/C/O**	**TYPE**	**WIDTH**	**DESCRIPTION**
Source	SourceofData	M	A	75	The name of the source 9-1-1 Authority that last updated the record.
					Example: SECC911.IA.us.gov
Updated	DateUpdate	M	D	26	Date of last update using ISO 8601 format.
					Example: 2010-10-12T16:34:44-6.01
Effective	EffectiveDate	O	D	26	Date the new record information goes into effect using ISO 8601 format.
					Example: 2013-01-15T01:00:00-6.01
Expire	ExpirationDate	O	D	26	Date when the information in the record is no longer considered valid.
					Example: 2020-05-25T10:23:16-6.01
AuthB_UID	ABUnqID	M	A	100	Combination of the static unique numerical ID, and the Authoritative Source ID to create a unique identifier within an aggregated set of data.
					Example: 212@Region12.eoc.ia
Country	Country	M	A	2	Two-letter Country name as defined by ISO 3166-1. English country alpha-2 code elements in capital ASCII letters.
					Example: US, CA, MX
State	State	M	A	2	Two-letter Country name as defined by ISO 3166-1. English country alpha-2 code elements in capital ASCII letters.
					Example: IA (Iowa), MN (Minnesota)

AUTHORITATIVE BOUNDARY					
FIELD	**XML**	**M/C/O**	**TYPE**	**WIDTH**	**DESCRIPTION**
Agency_UID	Agency_UID	M	A	100	A domain name which is used to uniquely Example: psap.clearlake.IA.us
GC_Exception	GC_Exception	C	A	75	Feature Exception codes Codes: See the IA GIS System User Guide

6.0 Highly Recommended Layer Category

6.1 Road Name Alias Table

Road names, especially highways, have a tendency to change names as they traverse through cities and towns. For this reason, a standardized method for the creation and maintenance of road name aliases is outlined below.

ROAD NAME ALIAS TABLE					
FIELD	**XML**	**M/C/O**	**TYPE**	**WIDTH**	**DESCRIPTION**
Source	DataSource	M	A	75	The name of the source 9-1-1 Authority that last updated the record. Example: SECC911.IA.us.gov
Updated	LastUpdate	M	D	26	Date of last update using ISO 8601 format. Example: 2010-10-12T16:34:44-6.00
Effective	EffectiveDate	O	D	26	Date the new record information goes into effect using ISO 8601 format. Example: 2013-01-15T01:00:00-6.00
Expire	ExpirationDate	O	D	26	Date when the information in the record is no longer considered valid. Example: 2020-05-25T10:23:16-6.00
Alias_UID	AliasUnqID	M	A	100	Combination of the static unique numerical ID and the source 9-1-1 Authority ID to create a unique identifier within an aggregated set of data. Example: 23548@johnston.ia.us

ROAD NAME ALIAS TABLE					
FIELD	**XML**	**M/C/O**	**TYPE**	**WIDTH**	**DESCRIPTION**
RoadCL_UID	RoadUnqID	M	A	100	The RCL_UID from the Road Centerlines layer that corresponds to the segment the alias name is assigned to. Within the Road Name Alias Table the RCL_UID may be repeated for each Road Name Alias assigned to that Road Segment. The RCL_UID must be universally unique for each road segment, but may be repeated in this table for each Road Name Alias that is assigned to that road segment. Example: 1215@stormlake.ia.us
A_PreMod	AliasPreMod	C	A	25	A word or phrase that precedes the Street Name element but is separated from it by a Street Name Pre Type or a Street Name Pre Directional or both. Example: Access, Alternate, Business, Bypass, Connector, Extended, Extension, Loop, Old, Overpass, Private, Public, Ramp, Scenic, Spur, Underpass.
A_PreDir	AliasPRD	C	A	2	A word preceding the Street Name that indicates the direction taken by the street from an arbitrary starting point or line, or the sector where it is located. Example: N, S, E, W, NE, NW, SE, SW
A_PreType	AliasSTP	C	A	20	A word or phrase that precedes the Street Name element and identifies a type of thoroughfare in a complete street name. Must always be spelled out. Example: "County Road" in County Road 20, "Interstate" in Interstate 34
A_PreSep	AliasPTS	C	A	15	A prepositional word or phrase between the Street Name Pre Type and the Street Name Example: "of the" in Avenue of the Saints

ROAD NAME ALIAS TABLE					
FIELD	**XML**	**M/C**	**TYP**	**WIDTH**	**DESCRIPTION**
A_StName	AliasRD	M	A	60	The element of the complete street name that identifies the particular street (as opposed to any street types, directionals, and modifiers) Example: "Oak" in South Oak Street
A_PosType	AliasSTS	C	A	4	A word or phrase that follows the Street Name element and identifies a type of thoroughfare in a complete street name. See USPS Publication 28 Appendix C1 for valid entries Example: "Street" in South Oak Street
A_PosDir	AliasPOD	C	A	2	A word following the Street Name that indicates the direction taken by the street from an arbitrary starting point or Example: N, S, E, W, NE, NW, SE, SW
A_PosMod	AliasPOM	C	A	12	A word or phrase that follows and modifies the Street Name, but is separated from it by a Street Name Post Type or a Street Name Post Directional or both. Example: Access, Alternate, Business, Bypass, Connector, Extended, Extension, Loop, Overpass, Private, Public, Ramp, Scenic, Spur, Underpass
AFS_PreDir	AFS_StreetNamePreDirectional	O	A	9	Fully Spelled out A_PreDir
AFS_PosType	AFS_StreetNamePostType	O	A	10	Fully Spelled out A_PosType
AFS_PosDir	AFS_StreetNamePostDirectional	O	A	9	Fully Spelled out A_PosDir
GC_Exception	GC_Exception	C	A	75	Feature Exception codes Codes: See the IA GIS System User Guide for code definitions

6.2 State Boundary

The final recommendations regarding inclusion of this layer in ECRF/LVF provisioning is still being debated at the workgroup level.

STATE BOUNDARY					
FIELD	**XML**	**M/C/O**	**TYPE**	**WIDTH**	**DESCRIPTION**
Source	SourceOfData	M	A	75	The name of the source 9-1-1 Authority that last updated the record. Example: SECC911.IA.us.gov
Updated	DateUpdate	M	D	26	Date of last update using ISO 8601 format. Example: 2010-10-12T16:34:44-6.00
Country	Country	M	A	2	Two-letter Country name as defined by ISO 3166-1. English country alpha-2 code elements in capital ASCII letters. Example: US, CA, MX
StateNGUID	StateUID	M	A	100	Unique ID for the state.
State	State	M	A	2	Two-letter Country name as defined by ISO 3166-1. English country alpha-2 code elements in capital ASCII letters. Example: IA (Iowa), MN (Minnesota)
GC_Exception	GC_Exception	C	A	75	Feature Exception codes Codes: See the IA GIS System User Guide for code definitions

6.3 County Boundaries

The final recommendations regarding inclusion of this layer in ECRF/LVF provisioning is still being debated at the workgroup level.

COUNTY BOUNDARIES					
FIELD	**XML**	**M/C/O**	**TYPE**	**WIDTH**	**DESCRIPTION**
Source	SourceOfData	M	A	75	The name of the source 9-1-1 Authority that last updated the record. Example: SECC911.IA.us.gov
Updated	DateUpdate	M	D	26	Date of last update using ISO 8601 format. Example: 2010-10-12T16:34:44-6.00
County_UID	CountyUnqID	M	A	100	Combination of the static unique numerical ID and the source 9-1-1 Authority ID to create a unique identifier within an aggregated set of data. Example: 23548@johnston.ia.us
Country	Country	M	A	2	Two-letter Country name as defined by ISO 3166-1. English country alpha-2 code elements in capital ASCII letters. Example: US, CA, MX
State	State	M	A	2	Two-letter Country name as defined by ISO 3166-1. English country alpha-2 code elements in capital ASCII letters. Example: IA (Iowa), MN (Minnesota)
County	County	M	A	75	County Name in which the point is located, completely spelled out, as defined in INCITS 38:2009 Example: Henry County
GC_Exception	GC_Exception	C	A	75	Feature Exception codes Codes: See the IA GIS System User Guide

6.4 Municipal Boundaries

The final recommendations regarding inclusion of this layer in ECRF/LVF provisioning is still being debated at the workgroup level.

MUNICIPAL BOUNDARIES					
FIELD	**XML**	**M/C/O**	**TYPE**	**WIDTH**	**DESCRIPTION**
Source	SourceOfData	M	A	75	The name of the source 9-1-1 Authority that last updated the record.
					Example: SECC911.IA.us.gov
Updated	DateUpdate	M	D	26	Date of last update using ISO 8601 format.
					Example: 2010-10-12T16:34:44-6.00
Effective	EffectiveDate	O	D	26	Date the new record information goes into effect using ISO 8601 format.
					Example: 2013-01-15T01:00:00-6.00
Expire	ExpirationDate	O	D	24	Date when the information in the record is no longer considered valid.
					Example: 2020-05-25T10:23:16-6.00
IncM_UID	IncorporatedMunUnqID	M	A	100	Combination of the static unique numerical ID and the source 9-1-1 Authority ID to create a unique identifier within an aggregated set of data.
					Example: 23548@johnston.ia.us
Country	Country	M	A	2	Two-letter Country name as defined by ISO 3166-1. English country alpha-2 code elements in capital ASCII letters.
					Example: US, CA, MX
State	State	M	A	2	Two-letter Country name as defined by ISO 3166-1. English country alpha-2 code elements in capital ASCII letters.
					Example: IA (Iowa), MN (Minnesota)
County	County	M	A	75	County Name in which the point is located, completely spelled out, as defined in INCITS 38:2009
					Example: Henry County

MUNICIPAL BOUNDARIES					
FIELD	**XML**	**M/C/O**	**TYPE**	**WIDTH**	**DESCRIPTION**
Inc_Muni	IncorporatedMunicipality	M	A	100	Incorporated municipality name. If a municipality name does not exist, populate with "Unincorporated". Example: Des Moines, Sioux City
GC_Exception	GC_Exception	C	A	75	Feature Exception codes Codes: See the IA GIS System User Guide for code definitions

6.5 Cell Sector Locations

NG9-1-1 systems can route wireless calls based on geodetic (coordinate based) locations of the calling device. Geodetic locations for mobile devices supported in NG9-1-1 are point, polygon, circle, ellipse, and arc-band. In some cases a latitude / longitude will be calculated fast enough to use for location based 9-1-1 call routing. In other cases a carrier will only be able to calculate an approximate location, such as a circle, ellipse, polygon, or arc-band, and the NG9-1-1 system will use the approximate location for location based 9-1-1 call routing. In these scenarios, no cell sector locations layer is necessary, since point or area geometries for mobile phone locations is computed in real time by wireless carrier position determination equipment, and made available in time for 9-1-1 call routing, and for display in the 9-1-1 PSAP.

However, in transitional NG9-1-1 systems (during the transition from E9-1-1 to NG9-1-1), carriers are generally unable to provide latitude/longitude coordinates for wireless 9-1-1 calls in time for routing, and are wholly unable to provide approximate geodetic locations (circle, ellipse, polygon, or arc-band) because required technology and interfaces are not available yet. In a transitional NG9-1-1 system, one accepted approach for routing wireless 9-1-1 calls is to utilize a look-up table to equate a 9-1-1 call's p/ANI to a cell sector polygon, insert the polygon into the call's PIDF-LO, and then query an ECRF using this location in order to determine the PSAP to route the call to. Cell sector polygons are also desirable to display in the 9-1-1 PSAP, when they are the best available approximate location for a 9-1-1 caller. For these reasons, and since all NG9-1-1 systems being implemented across the United States today are transitional in nature, the cell sector locations layer is a highly recommended GIS layer an a NG9-1-1 system.

Key considerations for building and maintaining a cell sector polygon layer include:

- ☐ Can the selected ESRP/LNG vendor provide p/ANI - to cell sector polygon - to PIDF-LO translation
- ☐ Can the selected PSAP mapping software display cell sector polygons

CELL SECTOR LOCATIONS					
FIELD	**XML**	**M/C/O**	**TYPE**	**WIDTH**	**DESCRIPTION**
Source	SourceOfData	M	A	75	The name of the source 9-1-1 Authority that last updated the record.
					Example: SECC911.IA.us.gov
Updated	DateUpdate	M	D	26	Date of last update using ISO 8601 format.
					Example: 2010-10-12T16:34:44-6.00
Effective	EffectiveDate	O	D	26	Date the new record information goes into effect using ISO 8601 format.
					Example: 2013-01-15T01:00:00-6.00
Expire	ExpirationDate	O	D	26	Date when the information in the record is no longer considered valid.
					Example: 2020-05-25T10:23:16-6.00
Country	Country	M	A	2	Two-letter Country name as defined by ISO 3166-1. English country alpha-2 code elements in capital ASCII letters.
					Example: US, CA, MX
State	State	M	A	2	Two-letter Country name as defined by ISO 3166-1. English country alpha-2 code elements in capital ASCII letters.
					Example: IA (Iowa), MN (Minnesota)
County	County	M	A	75	County Name in which the point is located, completely spelled out, as defined in INCITS 38:2009
					Example: Henry County
Cell_UID	CellUnqID	M	A	100	Some carriers have cell site identifications unique for that cell site within the entire carrier network. Leave blank if not applicable
Site_ID	Site_ID	C	A	10	Cell sector face or Omni as provided by carrier.
					Example: 1, 2, 3, Omni
Sector_ID	Sector_ID	M	A	4	The cell sector ID of the cell tower sector antenna face associated with the location
Switch_ID	Switch_ID	C	A	10	The Mobile Switch Center ID to which cell site is homed too
Cmarket_ID	CMarketID	C	A	10	The Market ID associated with the Mobile Switch Center the cell site is homed too
Csite_Name	CellSiteID	C	A	10	Name provided by the wireless service provider, usually unique to the cell site.

CELL SECTOR LOCATIONS					
FIELD	**XML**	**M/C/O**	**TYPE**	**WIDTH**	**DESCRIPTION**
ESRD_ESRK	ESR	C	N	10	The ESRD of the specific cell sector, if applicable, or the first number in the ESRK range for the PSAP
ESRK_Last	LastESRK	C	N	10	Last number in the ESRK range for the PSAP. Not used for ESRD.
CSctr_Ornt	Sector_Orientation	M	A	4	Antenna orientation associated with this location. Example: N, SE, SW
Technology	Tech	M	A	10	Type of radio protocol being utilized. Example: LTE, CDMA, GSM
GC_Exception	GC_Exception	C	A	75	Feature Exception codes Codes: See the IA GIS System User Guide for code definitions

7.0 Synchronization and Accuracy Standards

7.1 Synchronization Standards

In NG9-1-1 systems, the Road Centerline layer in GIS is what will absorb the content and purpose currently served by the MSAG in E9-1-1 systems for civic address location validation. The process of translating location information and a service URN request into a routing URI takes place via a Location to Service Translation (LoST) Protocol. According to the NENA informational document (71-501), a minimum 98% synchronization rate between MSAG, ALI, and GIS data is recommended before GIS data is considered viable for use in a LoST protocol.

7.2 Accuracy Standards

Improving the synchronization as recommended in 8.1 will also serve the purpose of improving the overall accuracy of the GIS layers. Because the purpose of this document is to provide recommendations for GIS data for use in ECRF and LVF functional elements, the accuracy standards will focus only on those required layers that will be provisioned into the ECRF and LVF.

- Road Centerlines
  - Must contain all information currently maintained in the MSAG in line with all mandatory attributes defined in the schema above
  - Must be broken at all PSAP and Emergency Services boundaries to accommodate proper left/right attribution
- PSAP and Emergency Service Boundaries
  - Must represent geographic extent and proper boundaries for all PSAP and Emergency Services
  - Must not contain any overlaps or gaps among polygons
  - Must be attributed as outlined in schema above
- Authoritative Boundary
  - Must represent the geographic extent of the source agency providing GIS data for inclusion in statewide layers
  - Must be attributed as outlined in schema above

8.0 QA/QC Error Codes and Feature Level Exceptions

8.1 QA/QC Errors

During the QA/QC process, implemented by the State of Iowa, topological and attribute level quality control checks are conducted at the feature level on the following GIS data layers:

- Road Centerline
- Site/Structure Address Point
- PSAP Boundary
- Emergency Service Boundaries
- Administrative Boundary
- County Boundary
- Municipal Boundary

As the QC/QC checks are completed, detailed errors are compiled as both a shapefile and .csv which are downloadable from the IA NG911 GeoLynx Server GIS Portal. Errors must be reviewed by the data steward and/or maintenance entity. These errors should be corrected, or if the features associated with an error are verified as valid, exception codes may be used to rectify future errors from being reported. Exception codes should be used only if data has been verified as true in real life. The jurisdiction can use the descriptions found below and in the *IA 9-1-1 Next Generation GIS Users Guide* on the IA NG911 GeoLynx Server GIS Portal to guide them in determining the appropriate error codes to input in the GIS data layer's exceptions field where applicable. The exceptions covered in the following section can be made at the feature level using the corresponding codes listed in the table below.

Road Centerline Error Codes

100	RCL_No_Value	RCL: No value found in a critical field
101	RCL_Value_Outside_Domain	RCL: Invalid value outside of acceptable values found in a critical field
102	RCL_Parsing	RCL: Separated street name fields do not match combined street field
103	RCL_Range_Overlap	RCL: Range overlaps with the ranges of another side of a road
104	RCL_Range_Parity	RCL: Range parity issue with mix of odd and even values on a side
105	RCL_Range_FROM_Higher	RCL: FROM range higher than TO range
200	RCL_Topology_Snapping	RCL: Segment is not snapped to adjacent segments
201	RCL_Topology_BND	RCL: Segment is not broken at or following one or more boundaries
202	RCL_Segment_Length	RCL: Segment length is too short
203	RCL_Topology_Dangle	RCL: Segment ends in dangling node

Site/Structure Address Point Error Codes

Code:	QC Check:	Discrepancy description:
300	SSAP_No_Value	SSAP: No value found in a critical field
301	SSAP_Value_Outside_Domain	SSAP: Invalid value outside of acceptable values found in a critical field
302	SSAP_Parsing	SSAP: Separated house number and street name fields do not match combined address field
304	SSAP_RCL_Range_Compare	SSAP: Street name in SSAP does not match street name in RCL layer or address does not fit in the range on a side of a road
400	SSAP_RCL_Segment_Compare	SSAP: Address spatially located on the wrong block/segment in RCL layer
401	SSAP_RCL_Parity_Compare	SSAP: Address spatially located on the wrong side of the segment in RCL layer
402	SSAP_Duplicate	SSAP: Address occurs more than once in SSAP layer[1]

Boundary Error Codes (PSAP, Emergency Services, Authoritative, State, County, Municipal)

Code:	QC Check:	Discrepancy description:
500	BND_No_Value	BND: No value found in a critical field
501	BND_Value_Outside_Domain	BND: Invalid value outside of acceptable values found in a critical field
600	BND_Topology_Gap	BND: Gap found between feature and other polygons in layer
601	BND_Topology_Overlap	BND: Feature overlaps with other polygons in layer

8.2 Feature Level Exceptions

Exceptions are flags at the feature level that notify QA/QC checks to omit the feature from specific checks. Features may have multiple exceptions and should be separated by commas with no spaces in the GIS data layer's exception field (i.e. 402,300). Caution should be used when setting exceptions for features within a GIS data set; exception codes are to be used when the data is representative of real life but is or will produce errors in the QA/QC process. Example exceptions and the appropriate codes for each data layer that are included in this standard can be found below. Refer to section 8.1 QA/QC Errors above for a list of valid exception codes.

Road Centerline Exception Examples

- Roads are outside the PSAPs boundary but are necessary for visualization within the PSAPs dispatch software and should not be a part of the statewide GIS database. (Code: 999)

1. The duplicate address check is accomplished through a concatenation of the following SSAP fields: TRIM([AddNum_Pre] & [Add_Number] & [AddNum_Suf] & [StN_PreMod] & [StN_PreDir] & [StN_PreTyp] & [StN_PreSep] & [StreetName] & [StN_PosTyp] & [StN_PosDir] & [StN_PosMod] & [ESN] & [MSAGComm] & [Post_Comm] & [Building] & [Floor] & [Unit] & [Room] & [Seat] & [Addtl_Loc]).

- Roads have known, unchangeable parity conflicts. (Code: 104)
- Driveways are included in the road centerline layer but should not be included in the statewide GIS database (Code: 999)

- Road endpoints are within 15ft of another road that do not connect in the real world (Code: 203)

Site/Structure Address Point Exception Examples

- Address points are mile post markers and are necessary for visualization within the PSAP and should be excluded from the statewide GIS database. (Code: 999)
- Address points have known, unchangeable addressing conflicts. (Code: 304, 400, 401)
- Points with no addresses have been included for reference and should not be included in the statewide GIS database (Code: 999)

Boundary Exception Examples (PSAP, Emergency Services, Authoritative, State, County, Municipal)

- Boundary data for a surrounding jurisdiction should not be included in the statewide GIS database. (Code: 999)

9.0 Conclusion

There are many considerations and variables in developing a statewide GIS dataset for NG9-1-1. Without the proper groundwork, it can be a formidable task. These standards are meant to lay that groundwork, and provide guidance for local entities as they approach the task of bringing source GIS data up to the necessary standards for inclusion in statewide layers to be provisioned into the ECRF and LVF functional elements of Iowa's NG9-1-1 system.

These standards closely follow the NENA DRAFT NG9-1-1 GIS Data Model which was not published at the time of completion for the Iowa standards. This must be taken into consideration, and modification may be necessary pending the final version of the NENA data model. At this stage, it is not expected that the core elements guiding GIS data for location validation and call routing will undergo radical changes; therefore, these standards will provide a solid foundation for NG9-1-1 GIS dataset development in the State of Iowa.

9.1 Reference Material and Recommended Reading

- NENA Detailed Functional and Interface Specification for the NENA i3 Solution – Stage 3 (i3), 08-003, Version 1, June 14, 2011
- NENA Information Document for Synchronizing Databases with MSAG & ALI, 75-001, Version 1.1, September 2009
- "NENA Standard for NG9-1-1 GIS Data Model", NENA-STA-XXX (DRAFT), National Emergency Number Association (NENA) Core Services Committee, Data Structures Subcommittee, NG9-1-1 GIS Data Model Working Group
- "NENA Standards for the Provisioning and Maintenance of GIS data to ECRF/LVF", (DRAFT – public review stage), National Emergency Number Association (NENA) Joint Data Technical Committee/ Operations Next Generation Integration Committee, Next Generation Data Development Working Group
- NENA Next Generation 9-1-1 (NG9-1-1) United States Civic Location Data Exchange Format (CLDXF) Standard, NENA-STA-004, March 23, 2014
- NENA Information Document for Synchronizing Geographic Information System databases with MSAG & ALI, NENA 71-501, Version 1.1, September 8, 2009
- Kansas NG9-1-1 GIS Data Model, version 1.0, GIS Subcommittee on behalf of the Kansas 911 Coordinating Council, May 7, 2014 http://www.kansas911.org/DocumentCenter/View/334
- NENA Master Glossary Of 9-1-1 Terminology, NENA ADM-000.17, National Emergency Number Association (NENA) Development Steering Committee (DSC), September 9, 2013
- Further references on NG9-1-1 http://www.nena.org/?NG911_Project