Pennsylvania Emergency Management Agency (PEMA)

Statewide 911 GIS Data Analysis Project

Final Report

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Executive Overview

In a Next Generation 911 (NG911) environment GIS data is mission critical and is utilized to spatially route 911 calls to the appropriate Public Safety Answering Point (PSAP).

Prior to transitioning to an NG911 system local entities, regions and states must begin the preparation and remediation of the 911 GIS data to support NG911. This includes developing GIS standards, determining and performing quality control to ensure all critical errors are resolved and education of all 911 GIS data providers at all levels of government.

In preparation for the implementation of an NG911 system, the Commonwealth of Pennsylvania contracted with GeoComm and AppGeo to:

- Assist PEMA in establishing the Pennsylvania NG911 GIS Standard and Best Practices Document for Road Centerlines and Site/Structure Address Points;
- Develop and host seven (7) in-person and one recorded educational session based on the Pennsylvania NG911 GIS Standard and Best Practices;
- Perform an assessment of each local jurisdiction's 911 GIS data to determine the level of current compliance with the Pennsylvania NG911 GIS Standard; and
- Prepare a final report to include the details of the project.

Pennsylvania NG911 GIS Standards

Purpose

The 911 GIS Data Analysis Project included the creation of a Road Centerline and Site/Structure Address Point Best Practice Document[1] for PEMA. This new document is complementary to the existing PEMA Public Safety Answering Point (PSAP), Emergency Service and Provisioning Boundaries Best Practice Document[2].

The purpose of the Road Centerline and Site/Structure Address Point Best Practice Document is to provide a common data model for the required Road Centerlines and Site/Structure Address Points GIS data layer and to set minimum accuracy benchmarks for Master Street Address Guide (MSAG), Automatic Location Information (ALI), and GIS data synchronization that must be attained before local data can be integrated into Pennsylvania's statewide dataset. NG911 requires higher levels of GIS data standardization and attribute detail than GIS data used for existing E911 systems. This document provides GIS data stewards with recommendations and best practices for creating and maintaining Road Centerlines and Site/Structure Address Points GIS data layers that will meet Pennsylvania's NG911 GIS data requirements.

Definition of required data layers

Road Centerlines

Road Centerlines represent the approximate centerline of a real-world roadway. The Road Centerlines GIS data layer utilizes arc-node topology with each road segment having attribute data associated with it

[1] https://www.pema.pa.gov/911/Documents/NG911-GIS-Best-Practices.PDF
[2] https://www.pema.pa.gov/911/Documents/PSAP_Boundary_Best_Practice_PEMA.pdf

that provides the segment's street name, civic address ranges and jurisdictional place names on each side of the segment, and other attribute information.

Site/Structure Address Points

Site/Structure Address Points represent the approximate location of a site or structure, or in some cases the location of access to a site or structure. Site/Structure Address Points can also represent landmarks. Each address point in the Site/Structure Address Points GIS data layer has attribute data associated with it that provides its street name, address number, jurisdictional place names, associated landmark name, and other attribute information.

Site/Structure Address Points generally provide more precise locations of addresses than can be found geocoding to Road Centerlines, particularly in areas with unusual addressing (e.g. flag lots, odd addresses on the even numbered side of a Road Centerline, even addresses on the odd numbered side of a Road Centerline), large properties with subaddresses (e.g. academic campuses, government complexes, mobile home parks), remote locations where a structure may be located far from the road from that it is addressed off of, and landmarks (some of which may not be addressed at all) that are well known features with names that might be the most or only identifiable information about the location.

The location attributes (e.g. Address Number, Street Name, place names) in the Site/Structure Address Points GIS data layer should be consistent with the location attributes (FROM/TO Address range, Street Name, place names) on the left or right side of the road segment in the Road Centerlines GIS data layer where the Address Point is located. However, this may not always be possible, especially in areas of unusual addressing.

PEMA NG911 GIS Data Model

The NG911 GIS Data Model for Pennsylvania was designed from the NENA NG911 GIS Data Model to support both NENA and Pennsylvania specific requirements. The NG911 GIS Data Model includes the following GIS Data Layers:

Required:

- Road Centerlines
- Site/Structure Address Points
- PSAP Boundary
- Provisioning Boundary
- Emergency Service Boundary (EMS, Fire, Law)

Strongly and/or Recommended:

- Cell Sector Location
- County Boundary
- Hydrology Line
- Hydrology Polygon
- Mile Marker Location
- Municipality Boundary
- Neighborhood Community Boundary
- Railroad Centerlines
- State Boundary
- Unincorporated Community Boundary

Only the required GIS data layers have been included in this report.

A template of the NG911 GIS Data Model can be downloaded from the PEMA Next Generation 911 GIS page at https://www.pema.pa.gov/911/Pages/Next-Generation-911-GIS.aspx

GIS Data Layer Table Descriptions

Each data layer is described in this document with a table listing the attributes. Section 5 that follows provides detailed attribute descriptions, required data domains, and example field values. The GIS data layer tables are formatted with the following information:

- **Descriptive Name:** Basic description of the data field name that clarifies the intent of the abbreviated name contained in the "Field Name" column.
- **Field Name:** The standardized data field name for GIS data used in an NG911 system. Local GIS data and the Pennsylvania statewide data layers must conform to this standard naming schema.
- **M/C/SR/O:** This column is used to indicate whether populating the attribute is Mandatory, Conditional, Strongly Recommended, or Optional.
    - **Mandatory** (M) – An attribute value must be populated in the data field for each record. Mandatory data fields must not be blank.
    - **Conditional** (C) – If an attribute value exists for a record, it must be populated in the data field. If no attribute value exists for a record, the data field is left blank.
    - **Strongly Recommended** (SR) – Not required to be populated in the local data at this time, however population of this field will be mandatory in the coming years. Currently it is a local decision on whether to populate the data field.
    - **Optional** (O) – Not required to be populated in the local data. It is a local decision on whether to populate the data field.
- **Type**: The required attribute type, as defined in NENA standards.
    - **P** – Printable ASCII characters (decimal codes 32 to 126). All field values must be fully spelled out and utilize title case, except in legacy fields which require upper case as per NENA 02-010, NENA Standard for Data Formats for 911 Data Exchange & GIS Mapping and where otherwise noted (e.g. Text fields in Esri feature classes and shapefiles).
    - **E** – UTF-8 restricted to character sets designated by the 911 Authority, but not including pictographic characters. This allows for foreign names that require Latin letters not in the ASCII character set (e.g. Latin letters with tilde or grave accents).
    - **U** – A Uniform Resource Identifier (URI) as described in Section 13, Terminology, and defined in RFC 3986, and also conforming to any rules specific to the scheme (e.g. sip:, https:, etc.) of the chosen URI. Depending on the provider of the relational database, this data type may vary.
    - **D** – Date and time. Information for a record represented as local time with offset from Coordinated Universal Time (UTC) as defined by the W3C "dateTime" datatype described in XML Schema Part 2: Datatypes Second Edition [3]. Since many GIS applications cannot currently utilize this format, local data may store the date and time in the local database date/time format but time must include seconds and may be recorded to 0.1 seconds. Local data stored in a local database date/time format will be converted to the NENA-required format in the Commonwealth dataset.
    - **F** – Floating (numbers that have a decimal place). There is no defined field length of a floating number; it is system dependent. However, in ESRI geodatabase feature classes and shapefiles, these shall be double fields.
    - **N** – Non-negative Integer. This field consists of whole numbers only. (e.g. In Esri geodatabase feature classes and shapefiles, these shall be short-integer or long-integer fields.)
- **Field Width**: The maximum field width, in number of characters.

Road Centerline Schema

Descriptive Name	Field Name	M/C/SR/O	Type	Field Width
Discrepancy Agency ID	DiscrpAgID	M	P	75
Date Updated	DateUpdate	M	D	-
Effective Date	Effective	O	D	-
Expiration Date	Expire	O	D	-
Road Centerline NENA Globally Unique ID	RCL_NGUID	M	P	254
Left Address Number Prefix	AdNumPre_L	C	P	15
Right Address Number Prefix	AdNumPre_R	C	P	15
Left FROM Address	FromAddr_L	M	N	6
Left TO Address	ToAddr_L	M	N	6
Right FROM Address	FromAddr_R	M	N	6
Right TO Address	ToAddr_R	M	N	6
Parity Left	Parity_L	M	P	1
Parity Right	Parity_R	M	P	1
Street Name Pre Modifier	St_PreMod	C	E	15
Street Name Pre Directional	St_PreDir	C	P	9
Street Name Pre Type	St_PreTyp	C	E	50
Street Name Pre Type Separator	St_PreSep	C	E	20
Street Name	St_Name	M	E	60
Street Name Post Type	St_PosTyp	C	E	50
Street Name Post Directional	St_PosDir	C	P	9
Street Name Post Modifier	St_PosMod	C	E	25
Legacy Street Name Pre Directional*	LSt_PreDir	C	P	2
Legacy Street Name*	LSt_Name	C	P	75
Legacy Street Name Type*	LSt_Type	C	P	4
Legacy Street Name Post Directional*	LSt_PosDir	C	P	2
ESN Left*	ESN_L	C	P	5
ESN Right*	ESN_R	C	P	5
MSAG Community Name Left*	MSAGComm_L	C	P	30
MSAG Community Name Right*	MSAGComm_R	C	P	30
Country Left	Country_L	M	P	2
Country Right	Country_R	M	P	2
State Left	State_L	M	P	2
State Right	State_R	M	P	2
County Left	County_L	M	P	40
County Right	County_R	M	P	40
Additional Code Left	AddCode_L	C	P	6
Additional Code Right	AddCode_R	C	P	6
Incorporated Municipality Left	IncMuni_L	M	E	100
Incorporated Municipality Right	IncMuni_R	M	E	100
Unincorporated Community Left	UnincCom_L	O	E	100
Unincorporated Community Right	UnincCom_R	O	E	100
Neighborhood Community Left	NbrhdCom_L	O	E	100
Neighborhood Community Right	NbrhdCom_R	O	E	100
Postal Code Left	PostCode_L	O	P	7
Postal Code Right	PostCode_R	O	P	7
Postal Community Name Left	PostComm_L	O	P	40
Postal Community Name Right	PostComm_R	O	P	40
Road Class	RoadClass	O	P	15
One-Way	OneWay	SR	P	2
Speed Limit	SpeedLimit	O	N	3
Validation Left	Valid_L	O	P	1
Validation Right	Valid_R	O	P	1

Descriptive Name	Field Name	M/C/SR/O	Type	Field Width
Complete Alias Street Name	Alias	C	E	245

Site/Structure Address Points Schema

Descriptive Name	Field Name	M/C/SR/O	Type	Field Width
Discrepancy Agency ID	DiscrpAgID	M	P	75
Date Updated	DateUpdate	M	D	-
Effective Date	Effective	O	D	-
Expiration Date	Expire	O	D	-
Site NENA Globally Unique ID	Site_NGUID	M	P	254
Country	Country	M	P	2
State	State	M	P	2
County	County	M	P	40
Additional Code	AddCode	C	P	6
Additional Data URI	AddDataURI	C	U	254
Incorporated Municipality	Inc_Muni	M	E	100
Unincorporated Community	Uninc_Comm	O	E	100
Neighborhood Community	Nbrhd_Comm	O	E	100
Address Number Prefix	AddNum_Pre	C	P	15
Address Number	Add_Number	C	N	6
Address Number Suffix	AddNum_Suf	C	P	15
Street Name Pre Modifier	St_PreMod	C	E	15
Street Name Pre Directional	St_PreDir	C	P	9
Street Name Pre Type	St_PreTyp	C	E	50
Street Name Pre Type Separator	St_PreSep	C	E	20
Street Name	St_Name	C	E	60
Street Name Post Type	St_PosTyp	C	E	50
Street Name Post Directional	St_PosDir	C	P	9
Street Name Post Modifier	St_PosMod	C	E	25
Legacy Street Name Pre Directional*	LSt_PreDir	C	P	2
Legacy Street Name*	LSt_Name	C	P	75
Legacy Street Name Type*	LSt_Type	C	P	4
Legacy Street Name Post Directional*	LSt_PosDir	C	P	2
ESN*	ESN	C	P	5
MSAG Community Name*	MSAGComm	C	P	30
Postal Community Name	Post_Comm	O	P	40
Postal Code	Post_Code	O	P	7
ZIP Plus 4	Post_Code4	O	P	4
Building	Building	SR	P	75
Floor	Floor	SR	P	75
Unit	Unit	SR	P	75
Room	Room	SR	P	75
Seat	Seat	O	P	75
Additional Location Information	Addtl_Loc	O	E	225
Complete Landmark Name	LandmkName	C	E	150
Mile Marker/Milepost	Milepost	C	P	150
Place Type	Place_Type	O	P	50
Placement Method	Placement	O	P	25
Longitude	Long	O	F	-
Latitude	Lat	O	F	-
Elevation	Elev	SR	N	6
Taxing Authority	TaxAuth	O	P	50
Parcel Identifier	UPI	O	P	50

Quality Control, GIS Synchronization and Accuracy Benchmarks

The most important part of preparation and maintenance of NG911 GIS data is synchronization and quality control.

Quality Control is an all-encompassing management approach that combines technical, qualitative and human resources to evaluate the quality of GIS data to meet the requirements of a system. Each GIS data layer, individually and in relation to each other, is analyzed to determine where integrity issues exist.

Integrity issues for NG911 GIS Data is categorized into two categories: critical and non-critical. Critical issues will cause issues with NG911 call routing and location validation functions and will not be accepted into the NG911 Core Service components. Non-critical issues have the potential to cause issues with both of these functions, however additional features within the system will ensure the calls are correctly routed. Non-critical errors may be identified by the NG911 Core Service provider but will not prevent the data from being provisioned into the system.

Prior to and during transition to a NG911 system, quality control between the 911 GIS data and the E911 routing databases, ALI and MSAG, must continue to be quality controlled through data synchronization. It is important to utilize the legacy street name elements within the Road Centerlines and Site/Structure Address Points datasets for synchronization with the legacy E911 databases. Integrity issues identified during the data synchronization process may need to be resolved through updates to the ALI and/or MSAG and the GIS data.

The process for quality control can be dependent on a variety of factors, however the major factors are the software utilized to perform the analysis and the format of the GIS data. Ultimately, the goal for NG911 is 98% accuracy for both the GIS data and the ALI to Road Centerlines synchronization.

Definitions of Commonly Used Quality Control Terms

Many terms are used for quality control that represent a group of fields within the GIS data. These groups of terms are listed below.

Street Name Elements:

> **Description:** All the CLDXF (fully spelled out) street name fields and/or all the legacy (abbreviated) street name fields in both the Road Centerlines and Site/Structure Address Points feature classes.
>
> **CLDXF:** Street Name Pre Modifier, Street Name Pre Directional, Street Name Pre Type, Street Name Pre Type Separator, Street Name, Street Name Post Type, Street Name Post Directional, Street Name Post Modifier
>
> **Legacy:** Legacy Street Name Pre Directional, Legacy Street Name, Legacy Street Name Type, Legacy Street Name Post Directional

Zone:

> **Description**: Any field or combination of fields used to ensure location uniqueness.
>
> **CLDXF**: May include Country, State, County, Incorporated Municipality
>
> **Legacy**: May include MSAG Community Name and ESN

Address Elements:

> **Description**: All the address and subaddress elements including Address Number Prefix, Address Number, Address Number Suffix, Building, Floor, Unit, Room, Seat, Additional Location Information.

General Quality Control Checks for NG911

The following checks should be performed during quality control on all GIS data layers.

- Field format validation (Critical): Check to identify where fields are not formatted to meet the PEMA GIS Data Model.
- Unique Identifier (Critical): Check to identify duplicate unique identifiers within individual or all source feature classes.
- Missing mandatory field values (Critical): Check to identify where mandatory field attribution, as defined in the PEMA GIS Data Model, is missing.
- Field values outside of domain: Check to identify where field values are outside of the acceptable domain values as defined by the PEMA GIS Data Model.

Boundary Quality Control Checks for NG911

The following checks should be performed during quality control on all boundary layers including Provisioning Boundary, PSAP Boundary and Emergency Service Boundaries; may also include County Boundary, Incorporated Municipality Boundary, Unincorporated Community Boundary and Neighborhood Community Boundary where available. Overlap errors are critical only for the Provisioning Boundary, PSAP Boundary and Emergency Service Boundaries.

- Boundary has gap: Check to identify where gaps exists between polygons in each boundary feature class.
- Boundary has overlaps (Critical): Check to identify where overlaps exist between polygons in each boundary feature class.
- Boundary does not cover the Provisioning Boundary (Critical): Check to identify where Emergency Service Boundaries do not cover the Provisioning Boundary in its entirety.

Site/Structure Address Point Quality Control Checks for NG911

The following checks should be performed during quality control on the site/structure address point data layer.

- Address found multiple times (Critical): Check to identify where site/structure addresses occur multiple times in a single Site/Structure Address Points dataset. This check analyzes all the street name elements, address elements and zone(s) to determine duplication of address points.
- Site/Structure Address Points outside Provisioning Boundary (Critical): Check to identify where site/structure address points exist outside of the Provisioning Boundary.

Road Centerline Quality Control Checks for NG911

The following checks should be performed during quality control on the road centerline data layer.

- Road centerline segment crosses a boundary layer: Check to identify where road segments cross a boundary and a split should occur. All boundaries where attribute values change should be included in the quality control. Includes, but may not be limited to, Incorporated Municipality Boundary, County Boundary, Provisioning Boundary, Emergency Service Boundaries.
- Road centerline segment does not meet length requirements: Check to identify where the length of a road segment is less than 10 feet.
- Road centerline segment FROM value is higher than the TO value: Check to identify where road segment address ranges have a higher FROM value than TO value.

- Road centerline segment has incorrect line directions: Check to identify where road segments are drawn in the opposite direction of addressing.
- Road centerline segments have overlapping address range values (Critical): Check to identify where road segments have overlapping address ranges in a given zone. The zone must be defined by the governing entity.
- Road centerline segment parity issue: Check to identify where a road segment has a mixture of even and odd address ranges on the same side of the segment and conflicts with the Parity Left and Parity Right field values.
- Road centerline segment not snapped to adjacent segments: Check to identify where road segments are not snapped to an adjacent segment.
- Road centerline segment has zero in address range value: Check to identify where road segment address ranges have a zero in one address range value and the other has a nonzero value.
- Road centerline outside Provisioning Boundary (Critical): Check to identify where road segments exist outside of the Provisioning Boundary.

Site/Structure Address Point to Road Centerline Synchronization Checks for NG911

The following synchronization should be performed during quality control on the site/structure address point data layer to the road centerline data layer.

- Fail on full street name: Check to identify where the site/structure address point's street name elements and road segment's street name elements are not identical.
- Fail on zone: Check to identify where the site/structure address point's address number and street name elements match the road segment but are not found in the same zone.
- Fail on address range: Check to identify where the site/structure address point's street name elements and zone match the road segment, but the address number falls outside of the road segment's address ranges.
- Fail on block: Check to identify where the site/structure address point's street name elements, zone and address number match the road segment, but the site/structure address point does not fall on the correct block.
- Fail on parity: Check to identify where the site/structure address point's street name elements, zone and address number match the road segment, but the site/structure address point falls on the wrong side of the road segment.

ALI and MSAG Synchronization Checks for Transition to NG911

A continued synchronization of the ALI and MSAG databases used in legacy 911 is important throughout the transition to a NG911 system. Telephone providers will continue to use a version of the legacy databases to validate to for an extended period of time. The following synchronizations between the legacy databases and GIS data will ensure that they two databases remain in sync. The goal for synchronization per the NENA standards is 98% between the ALI and Road Centerline.

ALI to Road Centerlines Synchronization

- Fail on full street name: Check to identify where the ALI street name elements and road segment's street name elements are not identical.
- Fail on zone: Check to identify where the ALI address number and street name elements match the road segment but are not found in the same zone.

- Fail on address range: Check to identify where the ALI street name elements and zone match the road segment, but the address number falls outside of the road segment's address ranges.

ALI to Site/Structure Address Points Synchronization

- Fail on full street name: Check to identify where the ALI street name elements and site/structure address point's street name elements are not identical.
- Fail on zone: Check to identify where the ALI address number and street name elements match the site/structure address point but are not found in the same zone.
- Fail on address range: Check to identify where the ALI street name elements and zone match the site/structure address point, but no exact address number match can be made.
- Fail on address number suffix: Check to identify where the ALI address number, street name elements and zone match the site/structure address point, but no exact address number suffix match can be made.

MSAG (Low and High) to Road Centerlines

- Fail on full street name: Check to identify where the MSAG street name elements and the road segment's street name elements are not identical.
- Fail on zone: Check to identify where an MSAG address range (high or low) and street name elements match the road segment but are not found in the same zone.
- Fail on address range: Check to identify where the MSAG street name elements and zone match the road segment, but no exact address range value match can be made.

Pennsylvania NG911 GIS Educational Sessions

Following the development of the Road Centerline and Site/Structure Address Points Best Practices Document, AppGeo along with PEMA and GeoComm designed educational sessions that were conducted at seven (7) locations across Pennsylvania. At the conclusion of the onsite educational sessions, a recording was developed for those who were not able to attend.

Location	Date	Number of Attendees
WestCORE NG911 (Allegheny County)	July 24, 2019	15
Northern Tier 911 (Elk County)	July 25, 2019	18
South Central Mountain 911 (Centre County)	July 26, 2019	22
NorthCentral/NorthCom 911 (Union County)	July 29, 2019	23
South Central NG911 (CCAP Headquarters)	July 30, 2019	23
South East Region 911 (Montgomery County)	July 31, 2019	23
NECORE NG911 (Monroe County)	August 1, 2019	25

Educational Session Topics

The recorded educational session and the presentation can be found on the PEMA website at https://www.pema.pa.gov/911/Pages/Next-Generation-911-GIS.aspx.

- Welcome and Introductions
- PEMA's Role in NG911
- What is NG911
    - Overview of an NG911 System
    - Why Standards are Needed
    - NENA NG911 GIS Data Model

    - I3 Standard for NG911
    - Required Data Layers
    - Strongly Recommended Layers
    - Recommended Layers
- Transition to NG911
- PEMA NG911 GIS Data Model
- Parsing Addresses for CLDXF
- Best Practices
    - Quality Control Checks
    - Road Centerlines
    - Site/Structure Address Points
    - Boundaries
    - Street Naming and Addressing
    - Military Installations
- Questions and Comments

Local GIS Data Assessment Results

GeoComm performed an extensive quality control on each jurisdiction in Pennsylvania. The following jurisdictions were individually processed:

- Adams
- Allegheny
- Armstrong
- Beaver
- Bedford
- Berks
- Blair
- Bradford
- Bucks
- Butler
- Cambria
- Cameron
- Carbon
- Centre
- Chester
- Clarion
- Clearfield
- Clinton
- Columbia/Montour
- Crawford
- Cumberland
- Dauphin
- Delaware
- Elk
- Erie
- Fayette
- Forest
- Franklin
- Fulton
- Greene
- Huntingdon
- Indiana
- Jefferson
- Juniata
- Lackawanna
- Lancaster
- Lawrence
- Lebanon
- Lehigh
- Luzerne
- Lycoming/Sullivan
- McKean
- Mercer
- Mifflin
- Monroe
- Montgomery
- Northampton
- Northumberland
- Perry
- Philadelphia
- Pike
- Potter
- Schuylkill
- Snyder/Union
- Somerset
- Susquehanna
- Tioga
- Venango
- Warren
- Washington
- Wayne
- Westmoreland
- Wyoming
- York

Quality Control Process Utilized

The following process was utilized by PEMA and GeoComm for quality control in Pennsylvania.

1. GeoComm along with the PEMA NG911 GIS Working Group established the quality control checks that would be utilized as a part of the project.
2. The PEMA NG911 GIS Working Group identified three (3) pilot jurisdictions – Juniata, Somerset, Lycoming/Sullivan – to process through quality control and review the results to ensure all checks were applicable.

3. PEMA requested each jurisdiction upload a copy of their GIS data, ALI and MSAG to GeoComm for review.
4. GeoComm reviewed all resources provided and documented them in a crosswalk that was distributed to jurisdictions for confirmation.
5. Each jurisdiction reviewed and confirmed crosswalk.
6. GeoComm processed quality control on each jurisdiction as crosswalks were confirmed.
7. Upon completion and GeoComm review of quality control results, two (2) recommendation reports in Excel and PDF were developed in preparation of a jurisdiction conference call to review the results.
8. GeoComm notified PEMA as jurisdictions were complete for calls.
9. PEMA and GeoComm completed each jurisdiction call to out brief on the results and reports.
10. Upon completion of conference calls, GeoComm distributed the results and reports to each jurisdiction via email.

Quality Control Checks Utilized

Quality control checks to be utilized were discussed and chosen by the PEMA NG911 GIS Working Group.

General Quality Control Checks		
QC Check	Description	Layer to Check
Critical Fields are Missing Value(s)	Check identifies where mandatory fields are missing values. This check can be run on Road Centerlines, SSAPs, Polygons, or ALI	Road Centerline
		Site/Structure Address Points
		Provisioning Boundary
		County Boundary
		EMS Boundary
		Fire Boundary
		Law Boundary
		PSAP Boundary
		Incorporated Municipality Boundary
MultiPart Geometry	Check identifies multipart features	Road Centerline
Critical Values Outside Domain	Check identifies values outside the acceptable list of value (Country, State, County, Parity, Legacy Pre & Post Direction, Legacy Type, CLDXF Pre & Post Direction, CLDXF Pre & Post Type, CLDXF Pre Modifer, PSAP URI)	Road Centerline
		Site/Structure Address Points
		Provisioning Boundary
		County Boundary
		EMS Boundary
		Fire Boundary
		Law Boundary
		PSAP Boundary
		Incorporated Municipality Boundary

Ingestion Validation Quality Control Checks		
QC Check	Description	Layer to Check
Field Format Validation	Check identifies where fields are not properly formatted.	All
Project, Tolerance and Resolution Check	Check identifies where datasets provided by the user have inconsistent projections.	All

Field Mapping Validation	Check verifies that the source data is consistent with existing field mapping information provided by the user.	All
UniqueID	If a unique ID field is provided, this check identifies where a source unique ID provided by the client is not actually unique. Applicable for every layer.	All

Boundary Quality Control Checks		
QC Check	Description	Layer to Check
Polygons Have Gaps - Esri Topology Tools	Using Esri topology tools, this check identifies where gaps exist in a polygon boundary layer using Esri Topology Tools. This check can be run on any municipal or service area boundary.	EMS Boundary
		Fire Boundary
		Law Boundary
		PSAP Boundary
Polygons Have Overlaps - Esri Topology Tools	Using Esri topology tools, this check identifies where overlaps exist in a polygon boundary layer. This check can be run on any municipal or service area boundary.	EMS Boundary
		Fire Boundary
		Law Boundary
		PSAP Boundary
Does Not Cover Authoritative Boundary - Esri Topology Tools	Using Esri topology tools, this check identifies where a Fire, Law, Medical, PSAP or County boundary does not cover the Authoritative Boundary using Esri Topology Tools.	EMS Boundary
		Fire Boundary
		Law Boundary
		PSAP Boundary
		County Boundary
Does Not Cover SSAP or RCL	Check identifies where the Authoritative Boundary does not cover RCLs or SSAP.	Road Centerline
		Site/Structure Address Points

Road Centerline Quality Control Checks		
QC Check	Description	Layer to Check
Cross a Boundary Layer	Check identifies where roads cross a boundary layer.	EMS Boundary
		Fire Boundary
		Law Boundary
		PSAP Boundary
		County Boundary
Does Not Meet Length Requirements	Check identifies where road segments do not meet length requirements (10 feet or less)	
From Value Higher Than To	Check identifies where road ranges have a higher ‘from’ value than ‘to’ value.	
Has Incorrect Direction	Check identifies where roads are not drawn in the direction of increasing address.	
Overlapping Address Range Values	Check identifies where roads have overlapping address ranges in a given community or zone.	

Parity Issue	Check identifies where roads have a mixture of even and odd ranges on one side of the street.
Has Stacked Segments	Check identifies where road centerlines are on top of one another or 'stacked'.
Not Snapped to Adjacent Segments	Check identifies where roads are not snapped to adjacent segments.
Has Zero In Range Value	Check identifies where road ranges have a zero From Value and nonzero To Value, or a zero To Value and a nonzero From Value.

Site/Structure Address Points Quality Control Checks	
QC Check	Description
Address Found Multiple Times	Check identifies where an SSAP address occurs multiple times in the dataset.
Synchronization issues between SSAP and Road Centerlines	This check compares SSAPs to Road Centerlines. It identifies addresses that do not have a matching street name or range in the road centerline layer or are spatially located on the wrong side of the road based on road centerline address ranging.
Sub checks include:	
Fail on Full Street Name	No house number No matching street name found
Fail on Zone	Address found only in a different ESN Address found only in a different community and ESN Address found only in a different community
Found Multiple Times	Address matches multiple road segments
Fail on Address Range	Address falls in a gap in the compatible ranges Address could not be found in compatible ranges Address is higher than compatible ranges Address is lower than compatible ranges
Fail on Block	Address falls along the wrong range block
Fail on Parity	Address falls on the wrong side (odd on even; even on odd)

ALI to Road Centerline and Site/Structure Address Point Synchronization Checks	
QC Check	Description
Critical Fields are Missing Value(s)	Check identifies where mandatory fields are missing values. Checks for Address Number, Street Name, ESN & MSAG Community
ALI to Site/Structure Address Points	
Fail on Full Street Name	No matching street name found
Fail on Zone	Address found only in a different ESN Address found only in a different community and ESN Address found only in a different community
Found multiple times	Address matches multiple road segments
Fail on Address Number	Address lies between existing house numbers Address is lower than compatible ranges Address is higher than compatible ranges
Fail on Address Number Suffix	Address found with different house number suffix
Fail on Unit Designation	Address found with a different unit designation
ALI to Road Centerlines	
Fail on Full Street Name	No matching street name found
Fail on Zone	Address found only in a different ESN Address found only in a different community and ESN

	Address found only in a different community
Found multiple times	Address matches multiple road segments
Fail on Address Range	Address falls in a gap in compatible ranges Address is higher than compatible ranges Address is lower than compatible ranges

ALI to Road Centerline and Site/Structure Address Point Synchronization Checks	
QC Check	Description
Critical Fields are Missing Value(s)	Check identifies where mandatory fields are missing values. Checks for High/Low Range, Street Name, ESN & MSAG Community
MSAG to Road Centerline (High and Low Ranges Processed Separately)	
No matching street name found	The street name in the MSAG was not found in the roads file.
No house number	High or low range not populated in MSAG record
Address is higher than compatible ranges	The street name exists in the road centerline layer, but the low or high range number of the MSAG record cannot be found in the road centerline ranges.
Address is lower than compatible ranges	The street name exists in the road centerline layer, but the low or high range number of the MSAG record cannot be found in the road centerline ranges.
Address falls in a gap in the compatible ranges	The street name exists in the road centerline layer, but the low or high range number of the MSAG record cannot be found in the road centerline ranges.
Address could not be found in compatible ranges	The street name exists in the road centerline layer, but the low or high range number of the MSAG record cannot be found in the road centerline ranges.
Address found only in a different ESN	The street name exists in the roads file, but the MSAG ESN is different than the road centerline.
Address found only in a different community and ESN	The street name exists in the roads file, but the MSAG Community and ESN is different than the road centerline.
Address found only in a different community	The street name exists in the roads file, but the MSAG Community is different than the road centerline.

Resources Received for Quality Control

Each jurisdiction submitted only the GIS data, ALI and MSAG available in their current 911 environment. Not every county submitted all the required resources. The chart below contains an overview on the number of counties who submitted each GIS data layer, ALI and MSAG.

Resources	Counties Submitting	Counties NOT Submitting
Provisioning Boundary	32	32
PSAP Boundary	40	24
Emergency Service Boundaries – EMS	62	2
Emergency Service Boundaries – Fire	63	1
Emergency Service Boundaries – Law	63	1
Road Centerlines	64	0
Site Structure Address Points	61	3
Incorporated Municipalities*	55	9
County*	37	27
ALI	61	3
MSAG	58	6

*Layer is strongly recommended and not mandatory

Most jurisdictions who did not submit Provisioning and/or PSAP Boundaries were in the process of creating them for NG911 at the time of the conference call.

Current GIS Accuracy for NG911

GIS data accuracy is a gauge to determine the amount of effort required for each jurisdiction to be prepared for the implementation of a NG911 system that utilized the GIS data for NG911 call routing and location validation. The current statewide GIS accuracy is 90.45%; the NENA benchmark for preparedness is 98% or higher.

Resources	Current Accuracy
Provisioning Boundary	82.58%
PSAP Boundary	44.48%
Emergency Service Boundaries – EMS	60.70%
Emergency Service Boundaries – Fire	63.22%
Emergency Service Boundaries – Law	57.56%
Road Centerlines	90.99%
Site Structure Address Points	90.22%
Incorporated Municipalities*	79.42%
County Boundary*	63.71%

Information about the remediation and estimated accuracy post-remediation can be found below.

Current GIS Accuracy for NG911 by County

The charts below show each Pennsylvania county or regional GIS accuracy by layer and overall based on the Quality Control performed within the project.

Adams	Accuracy
Provisioning Boundary	N/A
PSAP Boundary	N/A
Emergency Service Boundaries – EMS	N/A
Emergency Service Boundaries – Fire	69.90%
Emergency Service Boundaries – Law	77.95%
Road Centerlines	91.92%
Site Structure Address Points	91.27%
Incorporated Municipalities*	80.00%
County Boundary*	80.00%
GIS Accuracy	**91.37%**

Allegheny	Accuracy
Provisioning Boundary	N/A
PSAP Boundary	N/A
Emergency Service Boundaries – EMS	75.37%
Emergency Service Boundaries – Fire	76.82%
Emergency Service Boundaries – Law	75.28%
Road Centerlines	92.46%
Site Structure Address Points	91.79%
Incorporated Municipalities*	80.00%
County Boundary*	80.00%
GIS Accuracy	**91.88%**

Armstrong	Accuracy
Provisioning Boundary	80.00%
PSAP Boundary	60.00%
Emergency Service Boundaries – EMS	64.62%
Emergency Service Boundaries – Fire	93.75%
Emergency Service Boundaries – Law	73.33%
Road Centerlines	86.94%
Site Structure Address Points	91.55%
Incorporated Municipalities*	80.00%
County Boundary*	80.00%
GIS Accuracy	**90.54%**

Beaver	Accuracy
Provisioning Boundary	N/A
PSAP Boundary	50.00%
Emergency Service Boundaries – EMS	74.67%
Emergency Service Boundaries – Fire	74.87%
Emergency Service Boundaries – Law	74.75%
Road Centerlines	92.62%
Site Structure Address Points	91.15%
Incorporated Municipalities*	50.00%
County Boundary*	N/A
GIS Accuracy	**91.52%**

Bedford	Accuracy
Provisioning Boundary	80.00%
PSAP Boundary	0.00%
Emergency Service Boundaries – EMS	80.00%
Emergency Service Boundaries – Fire	44.76%
Emergency Service Boundaries – Law	37.14%
Road Centerlines	60.00%
Site Structure Address Points	0.00%
Incorporated Municipalities*	90.35%
County Boundary*	91.71%
GIS Accuracy	**91.18%**

Berks	Accuracy
Provisioning Boundary	100.00%
PSAP Boundary	75.00%
Emergency Service Boundaries – EMS	74.81%
Emergency Service Boundaries – Fire	74.81%
Emergency Service Boundaries – Law	74.61%
Road Centerlines	93.07%
Site Structure Address Points	84.36%
Incorporated Municipalities*	75.00%
County Boundary*	0.00%
GIS Accuracy	**86.70%**

Blair	Accuracy
Provisioning Boundary	80.00%
PSAP Boundary	60.00%
Emergency Service Boundaries – EMS	64.62%
Emergency Service Boundaries – Fire	93.75%
Emergency Service Boundaries – Law	73.33%
Road Centerlines	86.94%
Site Structure Address Points	91.55%
Incorporated Municipalities*	80.00%
County Boundary*	80.00%
GIS Accuracy	**90.54%**

Bradford	Accuracy
Provisioning Boundary	80.00%
PSAP Boundary	74.34%
Emergency Service Boundaries – EMS	60.12%
Emergency Service Boundaries – Fire	60.12%
Emergency Service Boundaries – Law	60.12%
Road Centerlines	93.12%
Site Structure Address Points	91.29%
Incorporated Municipalities*	80.00%
County Boundary*	80.00%
GIS Accuracy	**91.58%**

Bucks	Accuracy
Provisioning Boundary	N/A
PSAP Boundary	0.00%
Emergency Service Boundaries – EMS	79.96%
Emergency Service Boundaries – Fire	79.88%
Emergency Service Boundaries – Law	79.90%
Road Centerlines	56.38%
Site Structure Address Points	90.69%
Incorporated Municipalities*	80.00%
County Boundary*	N/A
GIS Accuracy	**84.97%**

Butler	Accuracy
Provisioning Boundary	N/A
PSAP Boundary	N/A
Emergency Service Boundaries – EMS	78.90%
Emergency Service Boundaries – Fire	79.20%
Emergency Service Boundaries – Law	77.73%
Road Centerlines	92.87%
Site Structure Address Points	90.72%
Incorporated Municipalities*	80.00%
County Boundary*	N/A
GIS Accuracy	**91.10%**

Cambria	Accuracy
Provisioning Boundary	N/A
PSAP Boundary	N/A
Emergency Service Boundaries – EMS	62.37%
Emergency Service Boundaries – Fire	38.26%
Emergency Service Boundaries – Law	56.41%
Road Centerlines	92.41%
Site Structure Address Points	86.43%
Incorporated Municipalities*	80.00%
County Boundary*	80.00%
GIS Accuracy	**87.84%**

Cameron	Accuracy
Provisioning Boundary	N/A
PSAP Boundary	N/A
Emergency Service Boundaries – EMS	78.00%
Emergency Service Boundaries – Fire	78.18%
Emergency Service Boundaries – Law	70.00%
Road Centerlines	92.34%
Site Structure Address Points	99.44%
Incorporated Municipalities*	80.00%
County Boundary*	80.00%
GIS Accuracy	**97.72%**

Carbon	Accuracy
Provisioning Boundary	N/A
PSAP Boundary	60.00%
Emergency Service Boundaries – EMS	77.50%
Emergency Service Boundaries – Fire	79.05%
Emergency Service Boundaries – Law	78.75%
Road Centerlines	91.29%
Site Structure Address Points	91.43%
Incorporated Municipalities*	80.00%
County Boundary*	N/A
GIS Accuracy	**91.39%**

Centre	Accuracy
Provisioning Boundary	80.00%
PSAP Boundary	0.00%
Emergency Service Boundaries – EMS	68.47%
Emergency Service Boundaries – Fire	72.07%
Emergency Service Boundaries – Law	29.74%
Road Centerlines	92.56%
Site Structure Address Points	91.67%
Incorporated Municipalities*	80.00%
County Boundary*	0.00%
GIS Accuracy	**91.83%**

Chester	Accuracy
Provisioning Boundary	80.00%
PSAP Boundary	79.95%
Emergency Service Boundaries – EMS	80.00%
Emergency Service Boundaries – Fire	79.99%
Emergency Service Boundaries – Law	79.99%
Road Centerlines	40.00%
Site Structure Address Points	0.00%
Incorporated Municipalities*	91.59%
County Boundary*	87.88%
GIS Accuracy	**88.36%**

Clarion	Accuracy
Provisioning Boundary	N/A
PSAP Boundary	N/A
Emergency Service Boundaries – EMS	79.74%
Emergency Service Boundaries – Fire	79.20%
Emergency Service Boundaries – Law	67.27%
Road Centerlines	91.35%
Site Structure Address Points	91.81%
Incorporated Municipalities*	100.00%
County Boundary*	80.00%
GIS Accuracy	**91.66%**

Clearfield	Accuracy
Provisioning Boundary	80.00%
PSAP Boundary	60.00%
Emergency Service Boundaries – EMS	0.00%
Emergency Service Boundaries – Fire	52.47%
Emergency Service Boundaries – Law	0.00%
Road Centerlines	92.53%
Site Structure Address Points	92.14%
Incorporated Municipalities*	80.00%
County Boundary*	80.00%
GIS Accuracy	**92.12%**

Clinton	Accuracy
Provisioning Boundary	N/A
PSAP Boundary	80.00%
Emergency Service Boundaries – EMS	78.97%
Emergency Service Boundaries – Fire	97.57%
Emergency Service Boundaries – Law	80.00%
Road Centerlines	90.25%
Site Structure Address Points	99.14%
Incorporated Municipalities*	N/A
County Boundary*	N/A
GIS Accuracy	**96.01%**

Columbia/Montour	Accuracy
Provisioning Boundary	80.00%
PSAP Boundary	40.00%
Emergency Service Boundaries – EMS	79.32%
Emergency Service Boundaries – Fire	79.32%
Emergency Service Boundaries – Law	79.32%
Road Centerlines	88.93%
Site Structure Address Points	89.71%
Incorporated Municipalities*	80.00%
County Boundary*	N/A
GIS Accuracy	**89.35%**

Crawford	Accuracy
Provisioning Boundary	80.00%
PSAP Boundary	N/A
Emergency Service Boundaries – EMS	0.00%
Emergency Service Boundaries – Fire	0.00%
Emergency Service Boundaries – Law	0.00%
Road Centerlines	93.02%
Site Structure Address Points	92.24%
Incorporated Municipalities*	80.00%
County Boundary*	0.00%
GIS Accuracy	**92.24%**

Cumberland	Accuracy
Provisioning Boundary	80.00%
PSAP Boundary	50.00%
Emergency Service Boundaries – EMS	62.64%
Emergency Service Boundaries – Fire	62.64%
Emergency Service Boundaries – Law	62.64%
Road Centerlines	92.44%
Site Structure Address Points	91.48%
Incorporated Municipalities*	N/A
County Boundary*	N/A
GIS Accuracy	**91.47%**

Dauphin	Accuracy
Provisioning Boundary	80.00%
PSAP Boundary	0.00%
Emergency Service Boundaries – EMS	71.60%
Emergency Service Boundaries – Fire	70.30%
Emergency Service Boundaries – Law	65.51%
Road Centerlines	90.53%
Site Structure Address Points	90.86%
Incorporated Municipalities*	80.00%
County Boundary*	0.00%
GIS Accuracy	**90.68%**

Delaware	Accuracy
Provisioning Boundary	80.00%
PSAP Boundary	60.00%
Emergency Service Boundaries – EMS	78.65%
Emergency Service Boundaries – Fire	78.65%
Emergency Service Boundaries – Law	79.02%
Road Centerlines	90.23%
Site Structure Address Points	83.17%
Incorporated Municipalities*	60.00%
County Boundary*	80.00%
GIS Accuracy	**87.04%**

Elk	Accuracy
Provisioning Boundary	N/A
PSAP Boundary	60.00%
Emergency Service Boundaries – EMS	77.50%
Emergency Service Boundaries – Fire	78.00%
Emergency Service Boundaries – Law	77.14%
Road Centerlines	93.17%
Site Structure Address Points	91.92%
Incorporated Municipalities*	N/A
County Boundary*	N/A
GIS Accuracy	**92.17%**

Erie	Accuracy
Provisioning Boundary	100.00%
PSAP Boundary	0.00%
Emergency Service Boundaries – EMS	0.00%
Emergency Service Boundaries – Fire	0.00%
Emergency Service Boundaries – Law	0.00%
Road Centerlines	90.98%
Site Structure Address Points	95.25%
Incorporated Municipalities*	80.00%
County Boundary*	80.00%
GIS Accuracy	**94.35%**

Fayette	Accuracy
Provisioning Boundary	N/A
PSAP Boundary	N/A
Emergency Service Boundaries – EMS	76.92%
Emergency Service Boundaries – Fire	79.49%
Emergency Service Boundaries – Law	78.00%
Road Centerlines	93.30%
Site Structure Address Points	90.74%
Incorporated Municipalities*	80.00%
County Boundary*	80.00%
GIS Accuracy	**91.25%**

Forest	Accuracy
Provisioning Boundary	N/A
PSAP Boundary	N/A
Emergency Service Boundaries – EMS	N/A
Emergency Service Boundaries – Fire	N/A
Emergency Service Boundaries – Law	N/A
Road Centerlines	93.82%
Site Structure Address Points	91.92%
Incorporated Municipalities*	80.00%
County Boundary*	80.00%
GIS Accuracy	**92.37%**

Franklin	Accuracy
Provisioning Boundary	N/A
PSAP Boundary	60.00%
Emergency Service Boundaries – EMS	77.21%
Emergency Service Boundaries – Fire	77.21%
Emergency Service Boundaries – Law	72.86%
Road Centerlines	89.79%
Site Structure Address Points	91.08%
Incorporated Municipalities*	N/A
County Boundary*	80.00%
GIS Accuracy	**90.69%**

Fulton	Accuracy
Provisioning Boundary	N/A
PSAP Boundary	N/A
Emergency Service Boundaries – EMS	78.97%
Emergency Service Boundaries – Fire	78.95%
Emergency Service Boundaries – Law	78.95%
Road Centerlines	92.43%
Site Structure Address Points	91.40%
Incorporated Municipalities*	80.00%
County Boundary*	N/A
GIS Accuracy	**91.65%**

Greene	Accuracy
Provisioning Boundary	100.00%
PSAP Boundary	60.00%
Emergency Service Boundaries – EMS	64.38%
Emergency Service Boundaries – Fire	64.29%
Emergency Service Boundaries – Law	74.62%
Road Centerlines	91.44%
Site Structure Address Points	86.92%
Incorporated Municipalities*	80.00%
County Boundary*	100.00%
GIS Accuracy	**87.88%**

Huntingdon	Accuracy
Provisioning Boundary	80.00%
PSAP Boundary	0.00%
Emergency Service Boundaries – EMS	73.54%
Emergency Service Boundaries – Fire	73.54%
Emergency Service Boundaries – Law	73.54%
Road Centerlines	93.13%
Site Structure Address Points	91.91%
Incorporated Municipalities*	80.00%
County Boundary*	80.00%
GIS Accuracy	**92.10%**

Indiana	Accuracy
Provisioning Boundary	N/A
PSAP Boundary	N/A
Emergency Service Boundaries – EMS	46.67%
Emergency Service Boundaries – Fire	0.00%
Emergency Service Boundaries – Law	0.00%
Road Centerlines	93.80%
Site Structure Address Points	89.72%
Incorporated Municipalities*	80.00%
County Boundary*	N/A
GIS Accuracy	**90.49%**

Jefferson	Accuracy
Provisioning Boundary	80.00%
PSAP Boundary	60.00%
Emergency Service Boundaries – EMS	71.11%
Emergency Service Boundaries – Fire	76.49%
Emergency Service Boundaries – Law	51.58%
Road Centerlines	92.96%
Site Structure Address Points	88.63%
Incorporated Municipalities*	N/A
County Boundary*	N/A
GIS Accuracy	**89.30%**

Juniata	Accuracy
Provisioning Boundary	N/A
PSAP Boundary	N/A
Emergency Service Boundaries – EMS	0.00%
Emergency Service Boundaries – Fire	0.00%
Emergency Service Boundaries – Law	62.50%
Road Centerlines	88.98%
Site Structure Address Points	91.45%
Incorporated Municipalities*	75.00%
County Boundary*	N/A
GIS Accuracy	**90.40%**

Lackawanna	Accuracy
Provisioning Boundary	N/A
PSAP Boundary	0.00%
Emergency Service Boundaries – EMS	80.00%
Emergency Service Boundaries – Fire	4.65%
Emergency Service Boundaries – Law	0.00%
Road Centerlines	N/A
Site Structure Address Points	N/A
Incorporated Municipalities*	93.27%
County Boundary*	87.19%
GIS Accuracy	**88.45%**

Lancaster	Accuracy
Provisioning Boundary	N/A
PSAP Boundary	N/A
Emergency Service Boundaries – EMS	24.74%
Emergency Service Boundaries – Fire	49.34%
Emergency Service Boundaries – Law	50.75%
Road Centerlines	86.28%
Site Structure Address Points	91.60%
Incorporated Municipalities*	80.00%
County Boundary*	80.00%
GIS Accuracy	**90.74%**

Lawrence	Accuracy
Provisioning Boundary	N/A
PSAP Boundary	N/A
Emergency Service Boundaries – EMS	80.00%
Emergency Service Boundaries – Fire	78.96%
Emergency Service Boundaries – Law	78.98%
Road Centerlines	92.82%
Site Structure Address Points	91.60%
Incorporated Municipalities*	N/A
County Boundary*	N/A
GIS Accuracy	**91.83%**

Lebanon	Accuracy
Provisioning Boundary	N/A
PSAP Boundary	N/A
Emergency Service Boundaries – EMS	40.00%
Emergency Service Boundaries – Fire	63.03%
Emergency Service Boundaries – Law	74.12%
Road Centerlines	93.67%
Site Structure Address Points	N/A
Incorporated Municipalities*	80.00%
County Boundary*	80.00%
GIS Accuracy	**93.63%**

Lehigh	Accuracy
Provisioning Boundary	N/A
PSAP Boundary	40.00%
Emergency Service Boundaries – EMS	63.24%
Emergency Service Boundaries – Fire	73.26%
Emergency Service Boundaries – Law	70.20%
Road Centerlines	91.59%
Site Structure Address Points	90.06%
Incorporated Municipalities*	N/A
County Boundary*	N/A
GIS Accuracy	**90.36%**

Luzerne	Accuracy
Provisioning Boundary	80.00%
PSAP Boundary	79.75%
Emergency Service Boundaries – EMS	79.74%
Emergency Service Boundaries – Fire	79.74%
Emergency Service Boundaries – Law	78.54%
Road Centerlines	92.93%
Site Structure Address Points	91.80%
Incorporated Municipalities*	80.00%
County Boundary*	80.00%
GIS Accuracy	**92.00%**

Lycoming-Sullivan	Accuracy
Provisioning Boundary	80.00%
PSAP Boundary	0.00%
Emergency Service Boundaries – EMS	66.28%
Emergency Service Boundaries – Fire	66.28%
Emergency Service Boundaries – Law	66.28%
Road Centerlines	92.84%
Site Structure Address Points	90.13%
Incorporated Municipalities*	75.00%
County Boundary*	75.00%
GIS Accuracy	**90.60%**

McKean	Accuracy
Provisioning Boundary	N/A
PSAP Boundary	N/A
Emergency Service Boundaries – EMS	79.29%
Emergency Service Boundaries – Fire	78.80%
Emergency Service Boundaries – Law	67.27%
Road Centerlines	90.64%
Site Structure Address Points	99.25%
Incorporated Municipalities*	80.00%
County Boundary*	80.00%
GIS Accuracy	**97.51%**

Mercer	Accuracy
Provisioning Boundary	80.00%
PSAP Boundary	60.00%
Emergency Service Boundaries – EMS	76.49%
Emergency Service Boundaries – Fire	78.96%
Emergency Service Boundaries – Law	78.84%
Road Centerlines	91.43%
Site Structure Address Points	91.09%
Incorporated Municipalities*	80.00%
County Boundary*	N/A
GIS Accuracy	**91.10%**

Mifflin	Accuracy
Provisioning Boundary	80.00%
PSAP Boundary	60.00%
Emergency Service Boundaries – EMS	57.50%
Emergency Service Boundaries – Fire	0.00%
Emergency Service Boundaries – Law	26.25%
Road Centerlines	92.73%
Site Structure Address Points	90.15%
Incorporated Municipalities*	80.00%
County Boundary*	0.00%
GIS Accuracy	**90.61%**

Monroe	Accuracy
Provisioning Boundary	80.00%
PSAP Boundary	60.00%
Emergency Service Boundaries – EMS	0.00%
Emergency Service Boundaries – Fire	59.00%
Emergency Service Boundaries – Law	0.00%
Road Centerlines	92.91%
Site Structure Address Points	91.89%
Incorporated Municipalities*	80.00%
County Boundary*	0.00%
GIS Accuracy	**92.04%**

Montgomery	Accuracy
Provisioning Boundary	N/A
PSAP Boundary	60.00%
Emergency Service Boundaries – EMS	79.94%
Emergency Service Boundaries – Fire	79.98%
Emergency Service Boundaries – Law	79.93%
Road Centerlines	91.39%
Site Structure Address Points	N/A
Incorporated Municipalities*	N/A
County Boundary*	N/A
GIS Accuracy	**91.25%**

Northampton	Accuracy
Provisioning Boundary	N/A
PSAP Boundary	N/A
Emergency Service Boundaries – EMS	75.42%
Emergency Service Boundaries – Fire	77.38%
Emergency Service Boundaries – Law	73.00%
Road Centerlines	91.08%
Site Structure Address Points	90.28%
Incorporated Municipalities*	80.00%
County Boundary*	N/A
GIS Accuracy	**90.42%**

Northumberland	Accuracy
Provisioning Boundary	80.00%
PSAP Boundary	N/A
Emergency Service Boundaries – EMS	69.25%
Emergency Service Boundaries – Fire	70.83%
Emergency Service Boundaries – Law	69.25%
Road Centerlines	81.89%
Site Structure Address Points	83.06%
Incorporated Municipalities*	80.00%
County Boundary*	N/A
GIS Accuracy	**82.78%**

Perry	Accuracy
Provisioning Boundary	N/A
PSAP Boundary	N/A
Emergency Service Boundaries – EMS	79.63%
Emergency Service Boundaries – Fire	79.63%
Emergency Service Boundaries – Law	79.63%
Road Centerlines	92.78%
Site Structure Address Points	90.55%
Incorporated Municipalities*	80.00%
County Boundary*	N/A
GIS Accuracy	**90.98%**

Philadelphia	Accuracy
Provisioning Boundary	N/A
PSAP Boundary	N/A
Emergency Service Boundaries – EMS	60.00%
Emergency Service Boundaries – Fire	60.00%
Emergency Service Boundaries – Law	60.00%
Road Centerlines	93.87%
Site Structure Address Points	92.12%
Incorporated Municipalities*	80.00%
County Boundary*	N/A
GIS Accuracy	**92.27%**

Pike	Accuracy
Provisioning Boundary	N/A
PSAP Boundary	N/A
Emergency Service Boundaries – EMS	78.60%
Emergency Service Boundaries – Fire	66.47%
Emergency Service Boundaries – Law	78.00%
Road Centerlines	92.92%
Site Structure Address Points	89.96%
Incorporated Municipalities*	N/A
County Boundary*	N/A
GIS Accuracy	**90.62%**

Potter	Accuracy
Provisioning Boundary	80.00%
PSAP Boundary	0.00%
Emergency Service Boundaries – EMS	66.04%
Emergency Service Boundaries – Fire	66.04%
Emergency Service Boundaries – Law	66.04%
Road Centerlines	91.54%
Site Structure Address Points	91.43%
Incorporated Municipalities*	80.00%
County Boundary*	80.00%
GIS Accuracy	**91.16%**

Schuylkill	Accuracy
Provisioning Boundary	80.00%
PSAP Boundary	20.00%
Emergency Service Boundaries – EMS	75.82%
Emergency Service Boundaries – Fire	76.05%
Emergency Service Boundaries – Law	72.06%
Road Centerlines	92.57%
Site Structure Address Points	64.46%
Incorporated Municipalities*	80.00%
County Boundary*	80.00%
GIS Accuracy	**70.03%**

Snyder/Union	Accuracy
Provisioning Boundary	N/A
PSAP Boundary	80.00%
Emergency Service Boundaries – EMS	80.00%
Emergency Service Boundaries – Fire	80.00%
Emergency Service Boundaries – Law	80.00%
Road Centerlines	80.00%
Site Structure Address Points	N/A
Incorporated Municipalities*	92.21%
County Boundary*	91.73%
GIS Accuracy	**91.83%**

Somerset	Accuracy
Provisioning Boundary	80.00%
PSAP Boundary	0.00%
Emergency Service Boundaries – EMS	0.00%
Emergency Service Boundaries – Fire	0.00%
Emergency Service Boundaries – Law	0.00%
Road Centerlines	82.04%
Site Structure Address Points	82.71%
Incorporated Municipalities*	75.00%
County Boundary*	75.00%
GIS Accuracy	**82.43%**

Susquehanna	Accuracy
Provisioning Boundary	80.00%
PSAP Boundary	0.00%
Emergency Service Boundaries – EMS	66.22%
Emergency Service Boundaries – Fire	0.00%
Emergency Service Boundaries – Law	44.00%
Road Centerlines	91.11%
Site Structure Address Points	89.16%
Incorporated Municipalities*	80.00%
County Boundary*	N/A
GIS Accuracy	**89.51%**

Tioga	Accuracy
Provisioning Boundary	80.00%
PSAP Boundary	60.00%
Emergency Service Boundaries – EMS	48.49%
Emergency Service Boundaries – Fire	48.49%
Emergency Service Boundaries – Law	48.49%
Road Centerlines	90.74%
Site Structure Address Points	88.14%
Incorporated Municipalities*	N/A
County Boundary*	100.00%
GIS Accuracy	**88.23%**

Venango	Accuracy
Provisioning Boundary	N/A
PSAP Boundary	60.00%
Emergency Service Boundaries – EMS	79.76%
Emergency Service Boundaries – Fire	79.76%
Emergency Service Boundaries – Law	79.76%
Road Centerlines	91.69%
Site Structure Address Points	91.71%
Incorporated Municipalities*	80.00%
County Boundary*	N/A
GIS Accuracy	**91.67%**

Warren	Accuracy
Provisioning Boundary	80.00%
PSAP Boundary	70.00%
Emergency Service Boundaries – EMS	75.56%
Emergency Service Boundaries – Fire	78.81%
Emergency Service Boundaries – Law	0.00%
Road Centerlines	90.92%
Site Structure Address Points	92.21%
Incorporated Municipalities*	80.00%
County Boundary*	20.00%
GIS Accuracy	**91.88%**

Washington	Accuracy
Provisioning Boundary	100.00%
PSAP Boundary	60.00%
Emergency Service Boundaries – EMS	0.00%
Emergency Service Boundaries – Fire	53.38%
Emergency Service Boundaries – Law	1.66%
Road Centerlines	91.64%
Site Structure Address Points	85.33%
Incorporated Municipalities*	100.00%
County Boundary*	100.00%
GIS Accuracy	**86.56%**

Wayne	Accuracy
Provisioning Boundary	N/A
PSAP Boundary	60.00%
Emergency Service Boundaries – EMS	72.97%
Emergency Service Boundaries – Fire	74.67%
Emergency Service Boundaries – Law	69.09%
Road Centerlines	92.91%
Site Structure Address Points	91.88%
Incorporated Municipalities*	80.00%
County Boundary*	N/A
GIS Accuracy	**92.07%**

Westmoreland	Accuracy
Provisioning Boundary	80.00%
PSAP Boundary	60.00%
Emergency Service Boundaries – EMS	43.67%
Emergency Service Boundaries – Fire	68.76%
Emergency Service Boundaries – Law	31.64%
Road Centerlines	93.14%
Site Structure Address Points	89.18%
Incorporated Municipalities*	80.00%
County Boundary*	80.00%
GIS Accuracy	**89.92%**

Wyoming	Accuracy
Provisioning Boundary	80.00%
PSAP Boundary	0.00%
Emergency Service Boundaries – EMS	55.56%
Emergency Service Boundaries – Fire	56.92%
Emergency Service Boundaries – Law	60.00%
Road Centerlines	93.68%
Site Structure Address Points	91.95%
Incorporated Municipalities*	N/A
County Boundary*	N/A
GIS Accuracy	**92.34%**

York	Accuracy
Provisioning Boundary	N/A
PSAP Boundary	N/A
Emergency Service Boundaries – EMS	72.05%
Emergency Service Boundaries – Fire	71.87%
Emergency Service Boundaries – Law	0.00%
Road Centerlines	93.62%
Site Structure Address Points	N/A
Incorporated Municipalities*	80.00%
County Boundary*	N/A
GIS Accuracy	**93.29%**

Current ALI & MSAG to GIS Data Accuracy for Transition to NG911

The primary benchmark utilized by NG911 Core Service Providers is the ALI to Road Centerline at or above 98%. While the traditional legacy ALI and MSAG will be converted to GIS-based resources within the NG environment most systems will utilize a version of legacy databases during transition. Below is a chart containing the current accuracy of the ALI and MSAG synchronization.

Resources	Current Accuracy
ALI to Road Centerline	77.87%
ALI to Site/Structure Address Points	71.66%
MSAG to Road Centerline	72.67%

Remediation Recommendations for Jurisdictions

Each jurisdiction was provided extensive documentation on the quality control errors and remediation steps to update the existing GIS data to meet the NG911 GIS data benchmarks. The information below provides both an overarching step in the process and the number of total errors across all jurisdictions. Errors are categorized into **Critical**, those that are not acceptable in the NG911 environment, and **Non-Critical**, those that should be corrected for sound GIS data but will be acceptable within the NG911 environment.

Critical Error Remediation Recommendations

Remediation Recommendation	Number of Errors
Add and populate the mandatory fields	5,878,422
Correction of extra spaces in mandatory fields	*Included in prior*
Create globally unique IDs	*Not analyzed*
Correct values outside of domain	271,531
Correct features outside or not fully covered by provisioning boundary	31,901
Correct boundary gaps and overlaps	15,204
Correct range overlaps	353,213
Correct ALI to Road Centerline errors	1,144,839
Migration of legacy street name elements to CLDXF street name elements	*Not analyzed*

Non-Critical Error Remediation Recommendations

Remediation Recommendation	Number of Errors
Site/Structure Address Points to Road Centerline Synchronization Errors	1,207,901
Road Centerline | Range FROM higher than TO	7,455
Road Centerline | Range Parity	17,211
Road Centerline | Segment Length	4,893
Road Centerline | Segment Topology Snapping	41,585
Road Centerline | Segment Multipart Geometry	1,764
ALI to Site/Structure Address Point Synchronization Errors	1,231,403

Predictive Accuracy Post Remediation
An estimate of accuracy based on correction of all critical errors is provided by below. The estimated statewide GIS data accuracy is approximately 97.89%. The NENA benchmark is 98%.

Appendix C contains charts of predicted accuracy by county.

Maintenance Recommendations

Maintenance begins when remediation of NG9-1-1 GIS data is at 98%. The process of quality control and synchronization is a vital process within maintenance and must be continued. The following items should be considered in maintenance and after reaching the transition goal.

Road Centerline Recommendations

- Split Centerlines at all other road intersections and boundaries – Fire, Law, EMS
- Add Elevation
- Align centerlines with bordering cities, counties and state
- Convert 0-0 ranges to NULL-NULL
- Populate the Alias field
- Request centerlines from military installations, where applicable
- Populate Validation Left / Right fields

Site/Structure Address Points Maintenance Recommendations

- Correct duplicate address points through subaddressing elements
- Align address points to structures
- Create access point, where applicable
- Create points for subaddress, where not already available
- Populate complete landmark name, where applicable
- Populate parcel identifier

Next Steps and Recommendations

Further Guidance on Topics Identified During the Educational Sessions

During the educational sessions a variety of topics requiring further discussion and guidance were identified by attendees.

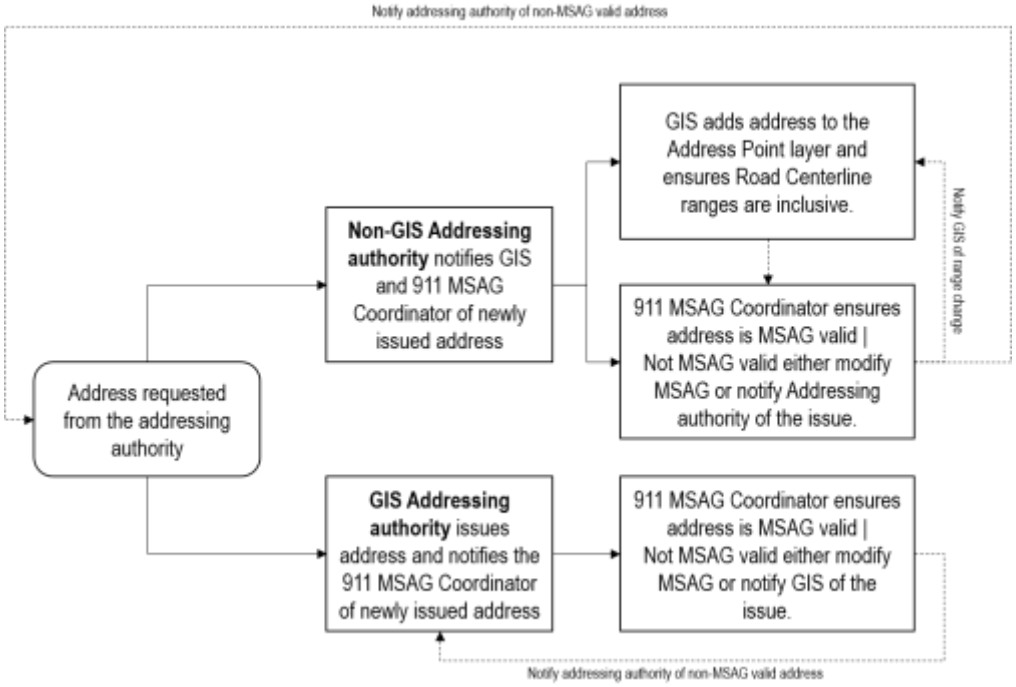
- Subset of Pre-Type field domain
- Identify the term used to identify emergency/maintenance crossovers
- Best practices for River Miles
- Provide a full list of PennDOT US and State Routes to counties
- Guidance on how to handle ramp names due to the 60-character limit of the street name field
- Guidance on the coming datum change and its effect on NG911 GIS data

Continual Coordination between 9-1-1 and GIS Personnel

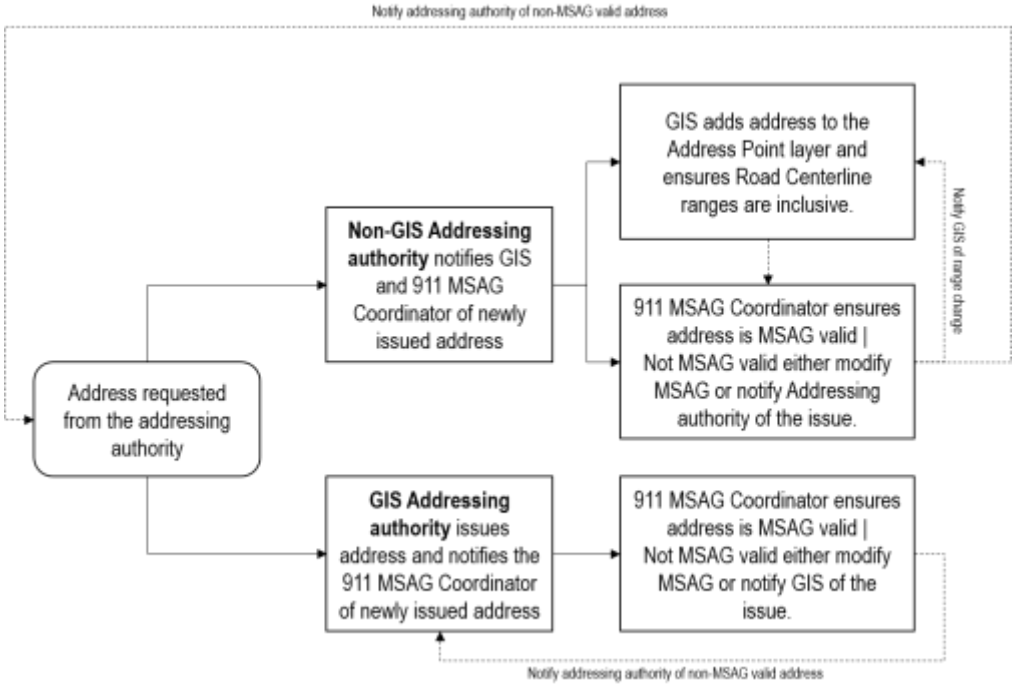
A key success component of NG911 is the coordination between 9-1-1 and GIS personnel. Neither organization can maintain the data and information required for NG911 systems alone. In particular, the MSAG Coordinators within 911 and the GIS personnel must build and maintain a strong communication plan. When changes occur in the MSAG for new addresses the MSAG Coordinator must notify GIS so that the changes are also made to the Road Centerline. As transition occurs it is likely that the NG911 Core Service Provider will implement a GIS-based MSAG, an MSAG built from the Road Centerlines of each jurisdiction. As the GIS-based MSAG becomes reality, the ALI, or TN listing, will be validated by the GIS-based MSAG and not the traditional MSAG currently maintained by the MSAG Coordinator. Once complete transition to NG911 has taken place, the locations will be validated and the calls will be routed using GIS data and the ALI will transition to a Location Database. The flowchart below depicts an example of the communication between 911 and GIS for pre and post transition to NG911 for maintenance of the E911 MSAG, transitional GIS-based MSAG and NG911 GIS data.

Along with the MSAG and address validation it is important for 911 and GIS to work together in the maintenance of response boundaries including but not limited to the PSAP, EMS, Fire and Law boundaries. If either entity is notified of a change in the boundary, they must notify the other to ensure all data resources are kept in sync.

Coordination before and during transition to NG911



Coordination after transition to NG911



Development of Stitch Points for Road Centerlines Meeting at Boundaries

One of the most important aspects of NG911 is a seamless, nationwide road centerline dataset. Each state must lead the effort to ensure that the road centerline is seamless statewide. This process can only be accomplished with guidance and support from the Commonwealth of Pennsylvania.

GIS data is maintained by numerous entities (counties, cities, regions) in disparate systems. The exact geographic location where road centerline segment endpoints meet at borders between the GIS data managing entities is impossible to match without a reference layer to indicate the exact location to both entities. Stitch points or border points can be created to assist in the effort of creating a topologically accurate, seamless, statewide dataset.

The boundaries to align to are:

- State Boundary
- County Boundary
- PSAP Boundary
- Incorporated Municipality Boundary

If a street name and ranging is carried across PSAP boundaries, a discussion between the PSAPs is needed to ensure the address ranges have no gaps or overlaps at the PSAP boundary and the ranges each PSAP is responsible for are located on the road segments within their PSAP Boundary. Street names should be assigned by the incorporated municipality as they usually have responsibility for naming roads in their jurisdiction.

Road Centerlines topology should be checked against boundary datasets to ensure that Road Centerlines snap to the boundaries. Some Road Centerlines follow municipal boundaries (e.g. County Line Road). Segmentation of these roads must match node for node with the corresponding boundary alignment. While County and PSAP boundaries within the Commonwealth of Pennsylvania should already be topologically correct for NG911, border states are likely to have a conflict with boundary delineation. Pennsylvania borders the following states:

- New York
- New Jersey
- Delaware
- Maryland
- West Virginia
- Ohio

At the time of publication of this report, New York and Pennsylvania have agreed on a contiguous boundary. There are other ongoing discussions being held with all other surrounding states with a goal to finalize the discussion by the end of 2019. When aligning road centerline data with these other states, care should be used to ensure that there are no overlaps or gaps in data. Working directly with the bordering jurisdictions will greatly reduce issues with the data. If there are no official State boundary layers on the PASDA website, PEMA should be contacted directly for guidance.

Use of Pennsylvania Specific Fields

In the development of the PEMA NG911 Data Model a few non-NENA NG911 GIS Data Model fields were added to support Pennsylvania needs. Additional information and guidance must to be provided to the local jurisdictions to ensure accurate attribute population.

These include:

- Taxing Authority (Site/Structure Address Points)
- Parcel Identifier (Site/Structure Address Points)
- Complete Alias Street Name (Road Centerline)
- FCC PSAP ID (PSAP Boundary)

Quality Control Exceptions

Throughout the project many local jurisdictions asked about the use of exception codes to mark GIS features as exceptions to the rule and allowable through the quality control checks. Exception codes are flags at the feature level that notify QC checks to omit the feature from a specific check. Features may have multiple exceptions. The use of exceptions should only be used to accommodate real-world situations that are identified as errors in the quality control process. Since caution should be used when setting exceptions for features within a GIS dataset and should only be used when there is a viable exception that will cause an error to be identified, the PEMA NG911 GIS Working Group should provide additional guidance on the use of these. Exception codes are also dependent on the NG911 Core Service Provider and should not be determined until a provider is selected.

Metadata

Metadata is information about data and every 9-1-1 data layer maintained by a local jurisdiction needs to have metadata. The minimum requirements and elements will need to be determined by the Commonwealth. The Federal Geographic Data Committee has defined mandatory fields and will be a starting place.

NGUID Prefixes for Other Emergency Service Boundaries

Per the NENA NG9-1-1 GIS Data Model documentation, Emergency Service Boundaries include entities beyond the mandatory EMS, Fire and Law Enforcement. While each jurisdiction has the ability to determine what these other emergency service boundary layers are, it is recommended that PEMA determine the NGUID prefix values for them.

Identification of Existing Scripts and Tools for Schema Transformation

Throughout the project several jurisdictions identified the need for the development of ETL (exact, transform, load) scripts and tools to assist the individual jurisdictions with migrating their individual, local schema to the PEMA NG9-1-1 GIS Data Model. It is recommended that the PEMA working group identify available scripts and tools or build these for use by local entities.

Other Recommendations

- Determine the impacts of reference system transformation to WGS84: The PEMA working group needs to determine the impact of the transformation and provide additional guidance on the proper methods to minimize impact.
- Determine the impacts of 2022 Datum Change: The PEMA working group needs to evaluate the impacts of the 2022 datum change and how to mitigate and minimize the amount of work effort required by the local jurisdictions.
- Provide guidance for mile marker / milepost for navigable water ways and river miles.
- Discuss the alignment of PennDOT roads to the NG911 centerlines provided by the local jurisdictions.
- Discuss Pennsylvania specific additions to the PEMA NG9-1-1 GIS Data Model (e.g. concatenated street name) and monitor the NENA NG9-1-1 GIS Data Model for updates.

Appendix A | USPS Publication 28 Street Suffixes and Directionals

GIS data attributes should follow these NENA USPS street suffixes publication standards.

Street Suffixes

GIS data attributes should follow these USPS street suffixes publication standards.

ALY	CLB	CVS	FRG	HLS	LGT	NCK	PSGE	SHR	TRL	WAYS
ANX	CLF	CYN	FRGS	HOLW	LGTS	OPAS	PT	SHRS	TRLR	WL
ARC	CLFS	DL	FRK	HTS	LK	ORCH	PTS	SKWY	TRWY	WLS
AVE	CMN	DM	FRKS	HVN	LKS	OVAL	RADL	SMT	TUNL	XING
BCH	CMNS	DR	FRST	HWY	LN	PARK	RAMP	SPG	UN	XRD
BG	COR	DRS	FRY	INLT	LNDG	PARK	RD	SPGS	UNS	XRDS
BGS	CORS	DV	FT	IS	LOOP	PASS	RDG	SPUR	UPAS	
BLF	CP	EST	FWY	ISLE	MALL	PATH	RDGS	SPUR	VIA	
BLFS	CPE	ESTS	GDN	ISS	MDW	PIKE	RDS	SQ	VIS	
BLVD	CRES	EXPY	GDNS	JCT	MDWS	PKWY	RIV	SQS	VL	
BND	CRK	EXT	GLN	JCTS	MEWS	PKWY	RNCH	ST	VLG	
BR	CRSE	EXTS	GLNS	KNL	ML	PL	ROW	STA	VLGS	
BRG	CRST	FALL	GRN	KNLS	MLS	PLN	RPD	STRA	VLY	
BRK	CSWY	FLD	GRNS	KY	MNR	PLNS	RPDS	STRM	VLYS	
BRKS	CT	FLDS	GRV	KYS	MNRS	PLZ	RST	STS	VW	
BTM	CTR	FLS	GRVS	LAND	MSN	PNE	RTE	TER	VWS	
BYP	CTRS	FLT	GTWY	LCK	MT	PNES	RUE	TPKE	WALK	
BYU	CTS	FLTS	HBR	LCKS	MTN	PR	RUN	TRAK	WALK	
CIR	CURV	FRD	HBRS	LDG	MTNS	PRT	SHL	TRCE	WALL	
CIRS	CV	FRDS	HL	LF	MTWY	PRTS	SHLS	TRFY	WAY	

Street Directionals

N	NE
E	SE
S	NW
W	SW

Appendix B | NENA Resources for CLDXF Standard Field Attributes

Pre and Post Directional Values

North
South
East
West
Northeast
Northwest
Southeast
Southwest

Street Name Pre and Post Types

NENA Registry System | Street Name Pre Types and Street name Post Types

http://technet.nena.org/nrs/registry/StreetNamePreTypesAndStreetNamePostTypes.xml

Street Name Pre Type Separators

NENA Registry System | Street Name Pre Type Separators

http://technet.nena.org/nrs/registry/StreetNamePreTypeSeparators.xml

Appendix C | County Predicted Accuracy

GIS Data Accuracy for Resolution of All Critical Errors

County	Predicted Accuracy
Adams	98.82%
Allegheny	99.31%
Armstrong	98.95%
Beaver	98.93%
Bedford	99.72%
Berks	99.56%
Blair	99.21%
Bradford	99.04%
Bucks	93.62%
Butler	98.55%
Cambria	95.23%
Cameron	99.26%
Carbon	99.22%
Centre	99.37%
Chester	98.34%
Clarion	99.09%
Clearfield	99.58%
Clinton	98.71%
Columbia/Montour	97.03%
Crawford	99.93%
Cumberland	99.04%
Dauphin	99.20%
Delaware	95.61%
Elk	99.54%
Erie	95.76%
Fayette	98.64%
Forest	99.68%
Franklin	98.53%
Fulton	98.97%
Greene	95.47%
Huntingdon	99.64%
Indiana	97.87%

County	Predicted Accuracy
Jefferson	96.75%
Juniata	98.19%
Lackawanna	95.47%
Lancaster	99.24%
Lawrence	99.19%
Lebanon	99.69%
Lehigh	97.94%
Luzerne	99.51%
Lycoming/Sullivan	98.08%
McKean	98.86%
Mercer	98.52%
Mifflin	98.61%
Monroe	99.42%
Montgomery	99.38%
Northampton	98.15%
Northumberland	91.68%
Perry	98.37%
Philadelphia	99.82%
Pike	98.05%
Potter	98.86%
Schuylkill	78.17%
Snyder/Union	99.19%
Somerset	92.45%
Susquehanna	96.96%
Tioga	96.30%
Venango	99.03%
Warren	99.53%
Washington	94.17%
Wayne	99.47%
Westmoreland	97.35%
Wyoming	99.71%
York	99.57%

Overall Data Accuracy for Resolution of All Critical Errors

Overall accuracy includes the current ALI and MSAG synchronization rates.

County	Predicted Accuracy
Adams	97.57%
Allegheny	98.50%
Armstrong	97.68%
Beaver	98.66%
Bedford	99.53%
Berks	98.39%
Blair	97.83%
Bradford	96.94%
Bucks	98.38%
Butler	98.55%
Cambria	87.47%
Cameron	98.98%
Carbon	97.48%
Centre	98.75%
Chester	97.73%
Clarion	92.15%
Clearfield	98.72%
Clinton	97.92%
Columbia/Montour	96.19%
Crawford	99.62%
Cumberland	97.45%
Dauphin	95.68%
Delaware	71.22%
Elk	98.72%
Erie	94.22%
Fayette	97.94%
Forest	99.68%
Franklin	97.11%
Fulton	98.36%
Greene	94.59%
Huntingdon	98.85%
Indiana	96.10%

County	Predicted Accuracy
Jefferson	96.71%
Juniata	97.32%
Lackawanna	64.64%
Lancaster	99.06%
Lawrence	98.27%
Lebanon	96.23%
Lehigh	97.79%
Luzerne	97.41%
Lycoming/Sullivan	96.21%
McKean	94.61%
Mercer	96.95%
Mifflin	96.28%
Monroe	99.01%
Montgomery	83.36%
Northampton	96.32%
Northumberland	86.42%
Perry	97.30%
Philadelphia	94.58%
Pike	96.97%
Potter	98.44%
Schuylkill	76.22%
Snyder/Union	97.44%
Somerset	90.19%
Susquehanna	95.99%
Tioga	95.93%
Venango	98.27%
Warren	98.98%
Washington	92.24%
Wayne	99.08%
Westmoreland	96.36%
Wyoming	97.65%
York	97.87%