

NENA Standards: Address Points and Boundaries

12/15/2020



DATAMARK Introductions:



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Introductions

Drew Fioranelli, GISP | *Public Safety GIS Expert*

- 13 years of experience working Local Government GIS
- Former GIS Director for Fauquier County, VA
- President of the Geospatial Information & Technology Association
- Former volunteer Firefighter – Bolivar County, MS
- Built the GIS Program at the City of Asheboro, NC

Mark Whitby, ENP | *Public Safety Subject Matter Expert*

- 21 years of experience working in the PSAP
- 10 years of experience with MSAG/ALI/GIS
- NENA/APCO member
- Active in NENA Work Groups

Agenda

- Site/Structure Address Points
- Civic Location Data Exchange Format (CLDXF)
- Required GIS Data Layers
- GIS Data Validations
- Data Maintenance

Address Numbers

- NENA recommends an address point every 5.28' (.001 miles).
- Allows for 1,000 unique numbered addresses per mile of road (there are 5,280 feet in a mile)
- Easy for an emergency service provider in the event of an emergency to look at the address and quickly figure out how far down the road the house is located.
- For example, if an ambulance were dispatched to 500 Alpine Lane it would need to travel exactly one-half mile to locate number 500.

Site/Structure Address Point



DEVELOPMENT OF SITE/STRUCTURE ADDRESS POINT GIS DATA FOR 9-1-1

[NENA-INF-014.1-2015]

This document guides the addressing authority on how to manage addresses for public safety. It provides best practices & scenarios including location accuracy of address points.

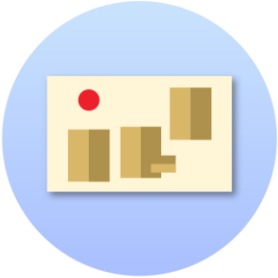
NENA Information Document for Development of Site/Structure Address Point GIS Data for 9-1-1

- https://www.nena.org/resource/resmgr/Standards/NENA-INF-014.1-2015_SSAP_INF.pdf
- Point placement, multi-points, cost factors, additional impacts, address points versus access points, address point placement methodologies, address ranges – actual versus potential, calculated placement and manual placement and examples

Address Point Placement Methodologies



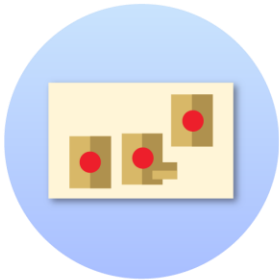
Geocoding
(from road centerlines)



Site



Parcel



Structure(s)

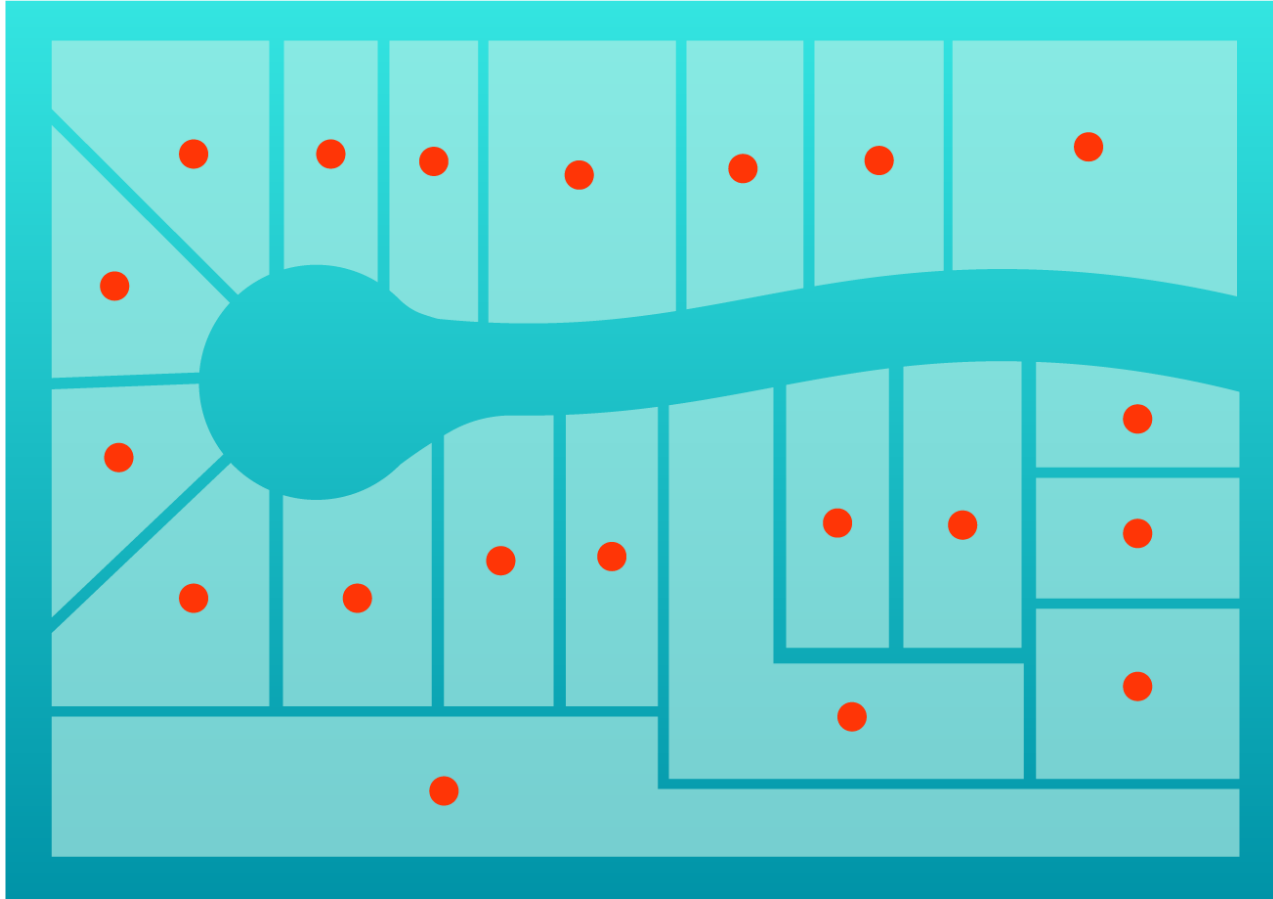


**Front Door
of Structure**



**Property
Access**

Parcel placement - Centroid



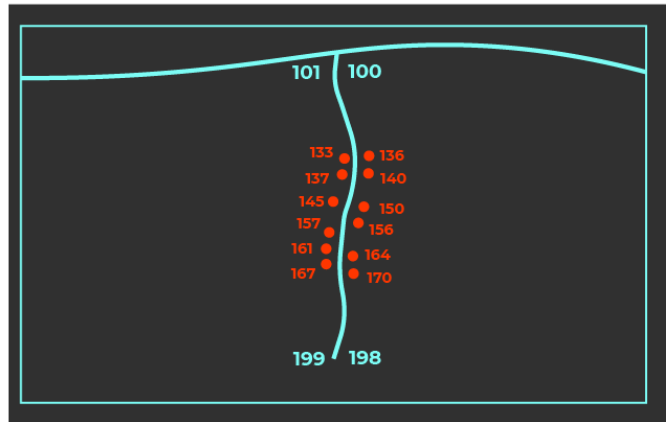
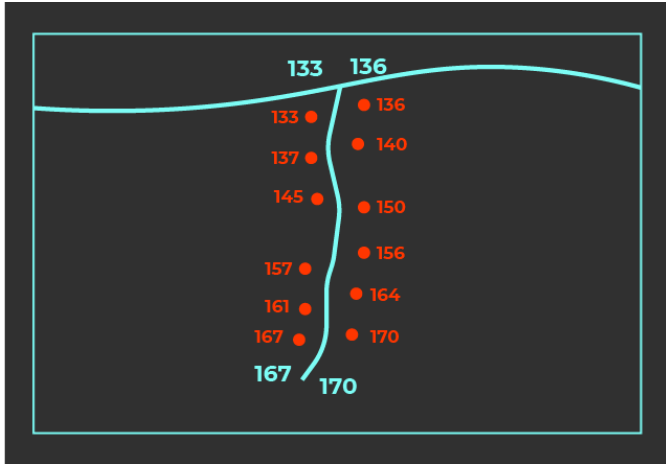
ADVANTAGES

- Can be automated & consistent
- Can be spatially joined to corresponding parcel by point-in-polygon

DISADVANTAGES

- May not identify the location of a specific structure, which is especially significant in a rural environment
- May not place well on multiple addresses in the same parcel

Geocoding - Ranges – Actual vs. Potential



ADVANTAGES

- Easy way to create address point placement in an automated fashion
- Allows for quick mass address point creation
- Parity is automatically set to match road centerlines

DISADVANTAGES

- Can result in spatial locations far from where the actual address exists
- Geocoded parity may not reflect reality

NENA Next Generation 9-1-1 (NG9-1-1) United States Civic Location Data Exchange Format (CLDXF) Standard

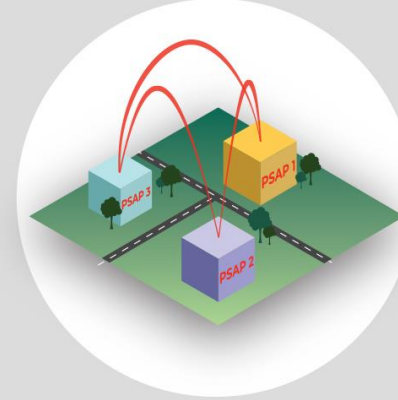


NENA Next Generation 9-1-1 (NG9-1-1) United States Civic Location Data Exchange Format (CLDXF) Standard

NENA-STA-004.1.1-2014
DSC Approval: 12/17/2013
PRC Approval: 03/10/2014
NENA Executive Board Approval: 03/23/2014

Prepared by:
National Emergency Number Association (NENA) Core Services Committee, Data Structures Subcommittee, Civic Location Data Exchange Work Group

Published by NENA
Printed in USA



UNITED STATES CIVIC LOCATION DATA EXCHANGE FORMAT (CLDXF) STANDARD

[NENA-STA-004.1.1-2014]

Enables the data between systems and PSAPs to talk to each other so that a PSAP 500 miles away can answer the call of a citizen

NG9-1-1 GIS Data Model: Location Data Parsing Requirements

Road Centerline and Address Point parsing is based on the Civic Location Data eXchange Format (CLDXF) Standard [NENA-STA-004.1.1-2014]

The CLDXF document was developed to:

- Provide a definitive set of core civic location data elements that support emergency call routing and dispatch.
- Map a profile between Presence Information Data Format-Location Object (PIDF-LO) and those same NENA core civic location data elements.
- Map those civic location data elements to the corresponding FGDC “United States Thoroughfare, Landmark, and Postal Address Data Standard” (FGDC-STD-016-2011) set of data elements, which was sponsored by the URISA and NENA.
- Provide illustrative examples of address parsing.

Defines the detailed data elements needed for address data exchange.

NG9-1-1 GIS Data Model: Location Data Parsing Requirements

8 Street Name Elements in NENA CLDXF Standard (Section 3.3)

1. **Street Name Pre-Modifier** (e.g., “Alternate” in Alternate Route 8)
2. **Street Name Pre-Directional** (e.g., “North” in North Fairfax Drive)
3. **Street Name Pre-Type** (e.g., “Avenue” in Avenue A; “County Route” in County Route 88)
4. **Street Name Pre-Type Separator** (e.g., “of the” in Avenue of the Americas)
5. **Street Name** (e.g., “Fairfax” in North Fairfax Avenue)
6. **Street Name Post Type** (e.g., “Avenue” in North Fairfax Avenue)
7. **Street Name Post Directional** (e.g., “East” in Seventh Street East)
8. **Street Name Post Modifier** (e.g., “Extended” in East End Avenue Extended)



NG9-1-1 GIS Data Model: Location Data Parsing Requirements

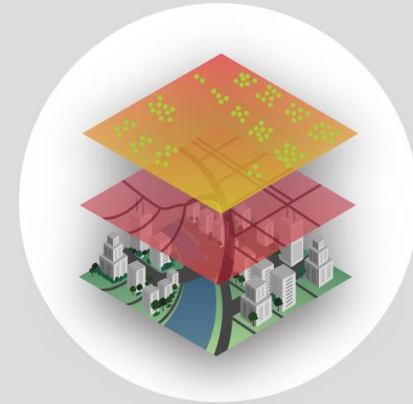
4 Address Number Elements in NENA CLDXF Standard (Section 3.4)

1. **Address Number Prefix** (alphanumeric prefix)
2. **Address Number** (integer to support address sorting, parity definition and in/out of address range tests)
3. **Address Number Suffix** (alphanumeric suffix, e.g., “1/2” in 119 ½ Elm St.)
4. **Optional:** Milepost may be given in place of or in addition to the address number

NG9-1-1 GIS Data Model: Location Data Parsing Requirements

6 Sub address Elements in NENA CLDXF Standard (Section 3.6)

1. **Building** (e.g., "Building A" in 456 Oak Street, Building A, Apartment 206)
2. **Additional Location Information** (e.g., "West Wing" in 1600 Pennsylvania Avenue NW, West Wing)
3. **Floor** (e.g., "Mezzanine" in 800 Jefferson Street, Mezzanine)
4. **Unit** (e.g., "Suite 3103" in 4300 Flamingo Avenue, Suite 3103)
5. **Room** (e.g., "Room 450F" in 1440 Market St., Room 450F)
6. **Seat** (e.g., "Cubicle 23" in 2500 Seventh Street, Room 105, Cubicle 23)



NG911 GIS DATA MODEL

[NENA-STA-006.1-2018]

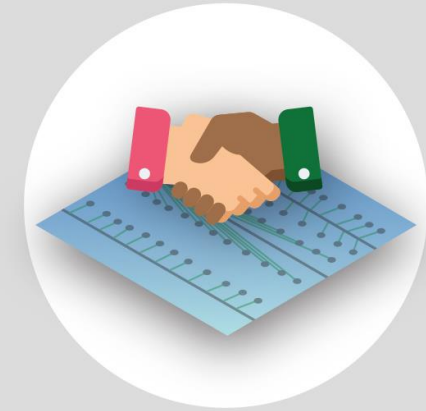
The GIS data authority maintains required layers for use within the ESInet. This standard recommends layers that will benefit dispatch & response functions or public safety beyond 9-1-1 call routing.

NENA ESB Working Group

- Part of the NENA NG9-1-1 GIS Data Model
 - https://cdn.ymaws.com/www.nena.org/resource/resmgr/standards/nena-sta-006.1.1-2020_ng9-1-.pdf
- GIS Data Stewardship – NG9-1-1 Emergency Service Boundaries
 - The focus of this working group is to provide information specific to the purpose and intended use of ESB's within NG9-1-1 as well as best management practices from the creation and stewardship of these layers
 - Still working on document

NENA PSAP Boundary

- NENA Information Document for GIS Data Stewardship for Next Generation 9-1-1 (NG9-1-1)
 - https://cdn.ymaws.com/www.nena.org/resource/esmgr/standards/NENA_INF_028.1_2020_GISDataS.pdf
- Initial development, modification and refining the PSAP boundaries, and long-term maintenance



**NENA INFORMATION DOCUMENT FOR
GIS DATA STEWARDSHIP FOR NG9-1-1
(DRAFT)**

[NENA-INF-028.1-2015]

Provides guidance to localities on roles and responsibilities to managing GIS data for public safety and beyond.

Minimum Spatial Data Required to Support ECRF/LVF in i3 NG9-1-1 Architecture

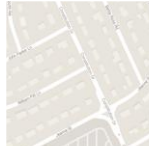


PSAP
Boundaries

Source: “The **9-1-1 Authority is responsible** for coordinating with local addressing authorities and GIS data providers for the provisioning of address data in a GIS format to the Emergency Call Routing Function/Location Validation Function (ESInet).” *NENA STA-005.11*



Road
Centerlines

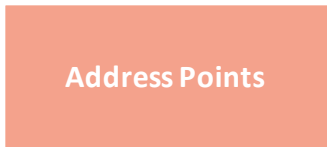


Footprint: each PSAP needs access to a **seamless, normalized and highly accurate** footprint of data from any jurisdiction it shares a boundary with.

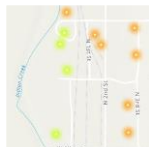


Emergency Services
Boundaries

Update: **new data and data errors** should be updated in the GIS within a 3-business day cycle.



Address Points



Accuracy: Each source entity is responsible for the accuracy (both spatial and attribution) of each dataset. This results in the need for coordination amongst neighboring jurisdictions as there are **no allowable gaps, overlaps or redundancies** in any of the datasets.



Provisioning
Boundaries

Required Datasets: Address Points



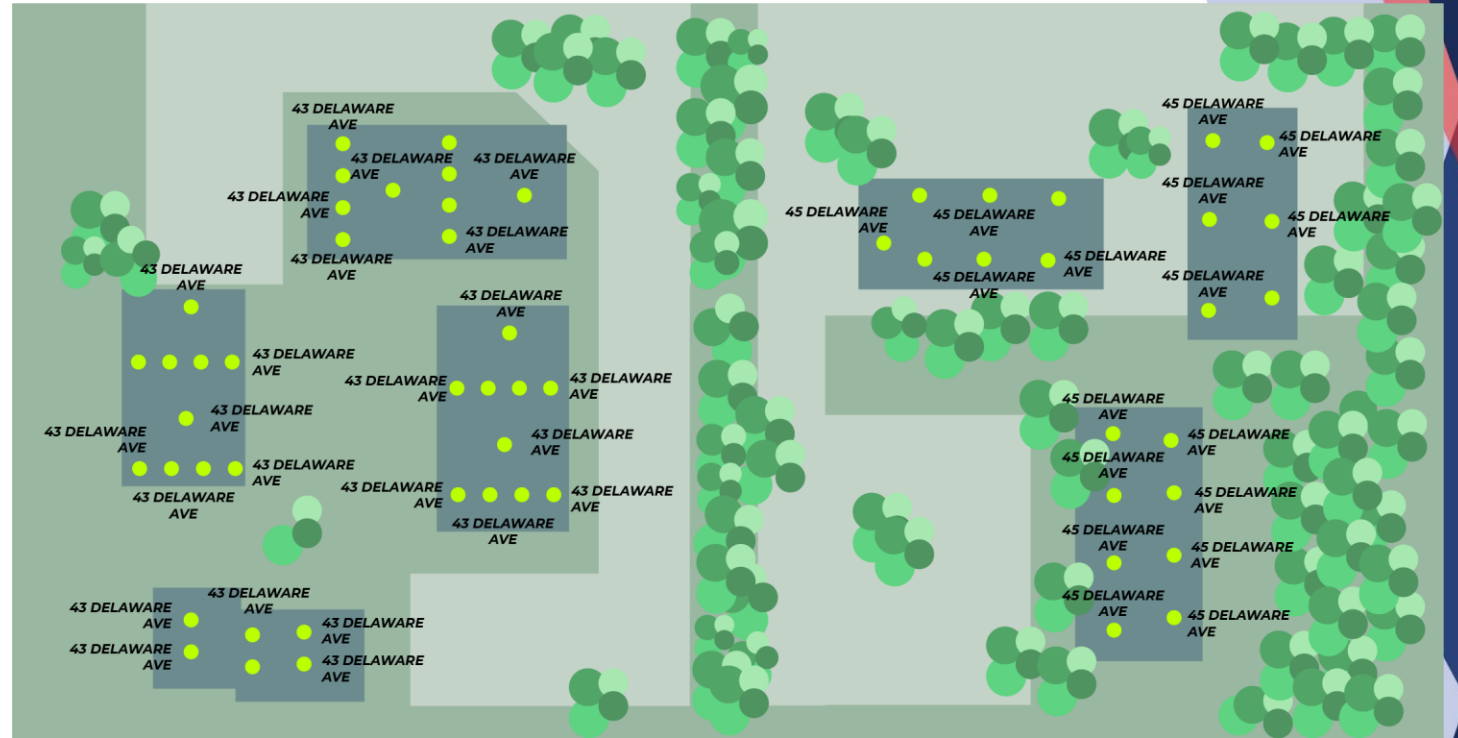
- Required
- Most precise call and resource routing
- Structure-based, sub-addresses
- Includes non-addressed dispatchable locations

Sub-Addressing

The process of identifying multi-unit structures, who share a common mailing address, with unique identifiers.

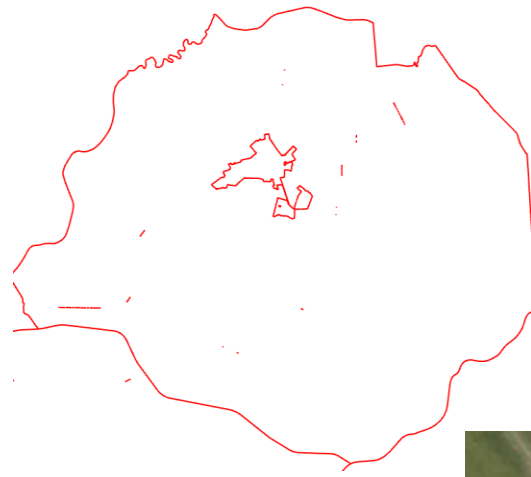
Examples are:

- Colleges/Universities
- Military Installation
- Shopping centers/Malls
- Strip Malls
- Apartments/Condominiums



FI D	Shape	City	Zip	ADDRNUM	FULLNAME	NAME	TYPE	SUFDIR	POSTMOD	ADDRESS	ADDR_ESN	LABEL	SUBNAME	ESN	COUNTY	STATE
0	Point	Olive Hill	41164	489	WATER AVE	WATER	AVE			489 WATER AVE		489 WATER AVE		831		
1	Point	Olive Hill	41164	527	WOODSIDE ST	WOODSIDE	ST			527 WOODSIDE ST		527A WOODSIDE ST	A	831		
2	Point	Olive Hill	41164	455	WOODSIDE ST	WOODSIDE	ST			455 WOODSIDE ST		455B WOODSIDE ST	B	831		
3	Point	Olive Hill	41164	414	WOODSIDE ST	WOODSIDE	ST			414 WOODSIDE ST		414C WOODSIDE ST	C	831		
4	Point	Olive Hill	41164	311	PENSON ST	PENSON	ST			311 PENSON ST		311 PENSON ST		831		
5	Point	Olive Hill	41164	371	PENSON ST	PENSON	ST			371 PENSON ST		371 PENSON ST		831		

Required Datasets: PSAP Boundary

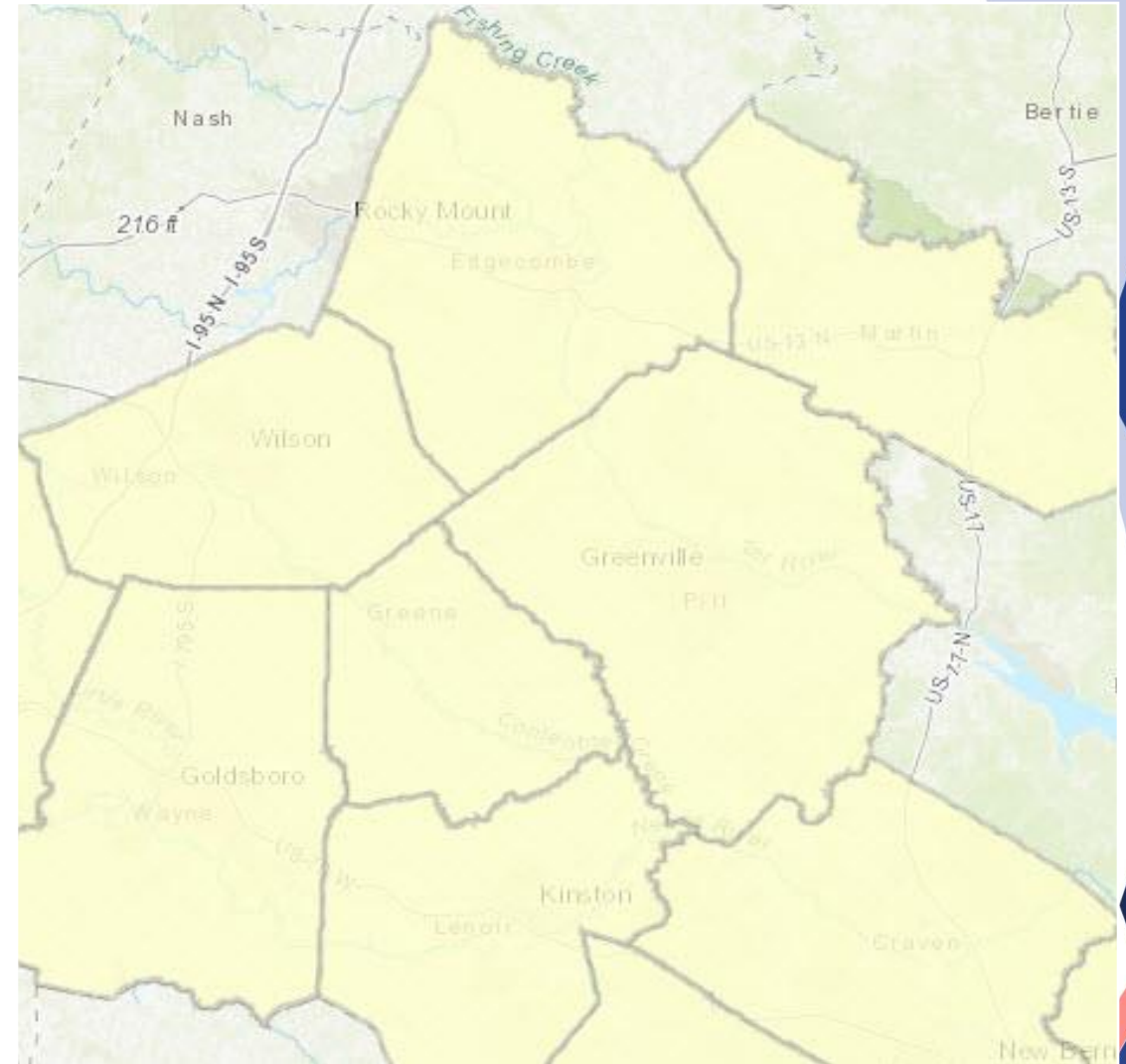


- Required
- Primary PSAP
- Need footprints for neighboring primary PSAPs
- No gaps, overlaps or duplicate polygons



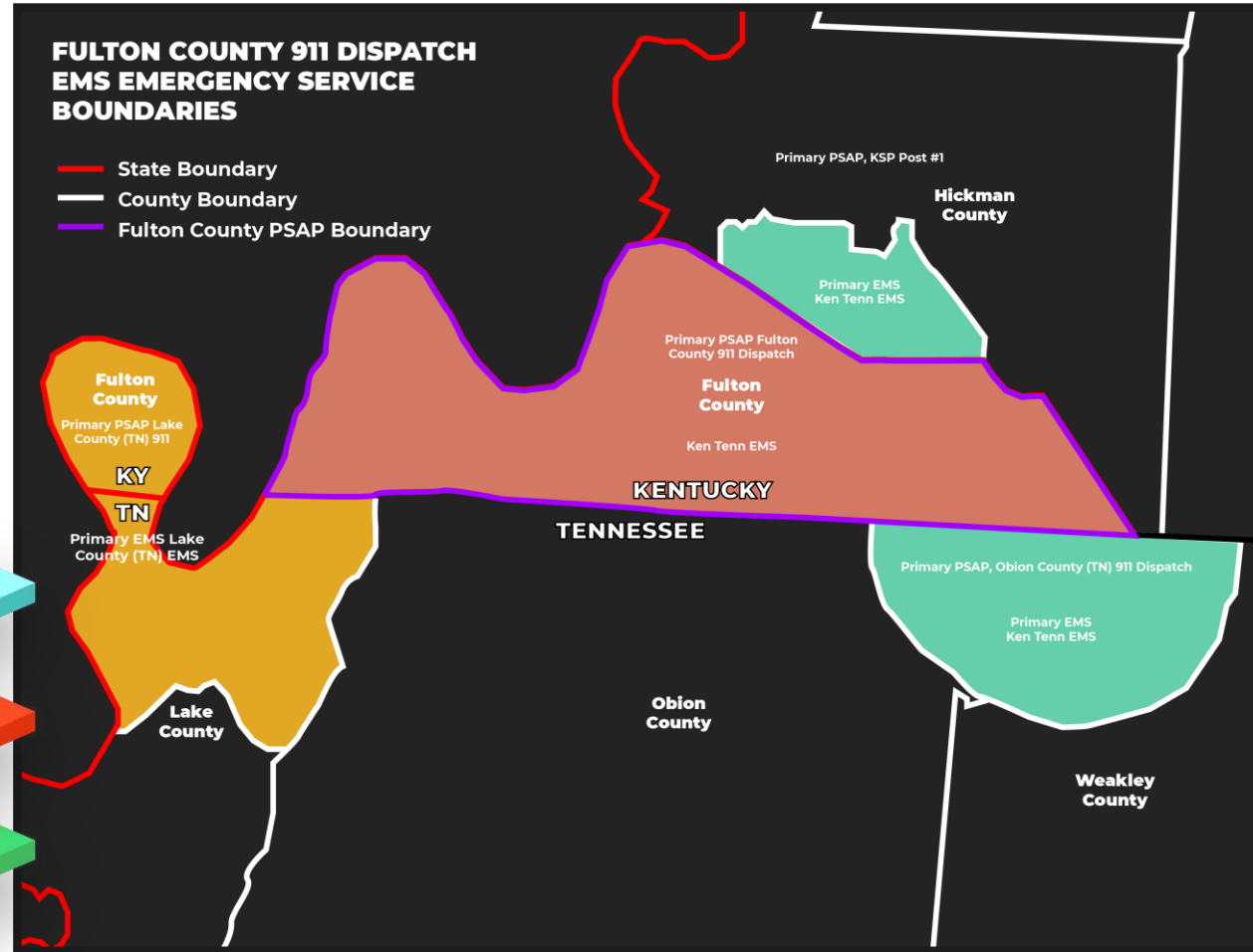
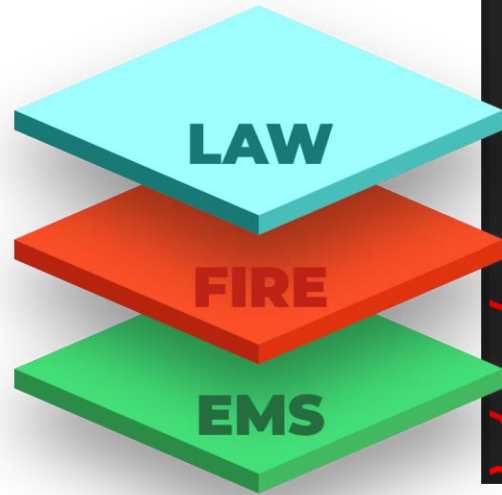
Required Datasets: Provisioning Boundary

- Defines the area of GIS data provisioning
- Must be agreed upon with all adjoining data provisioning providers
- Determines the entity responsible for completing discrepancy resolution
- Geofence in Spatial Interface



Required Datasets: Emergency Service Boundaries

- Fire, Police, EMS Layers
- **Not ESZ Layer**
- No gaps, overlaps or duplicates



GIS Data Validations

Validations

Value in Validating GIS data: to ensure maintenance of high-level accuracy, completeness and synchronization.

Spatial Interface (SI) shall report to 9-1-1 Authority on GIS data quality control checks. Some issues that could be reported back to the 9-1-1 Authority from the SI are:

- Invalid geometry
- Gap/overlap
- Duplicate attribute as defined by the SI system
- Mandatory field(s) missing or mismatched data types
- Address range issues on centerline
- General provisioning failure to SI or ECRF/LVF
- Malformed Uniform Resource Identifier (URI)

NOTE: It is expected that **9-1-1 Authorities** will perform Quality Assurance/Quality Control (QA/QC) processes listed above **prior to provisioning** the data into the SI thus minimizing the errors and resolution timeframe for the provisioning process.

NG9-1-1 Data Management Requirements (REQ-002)

https://cdn.ymaws.com/www.nena.org/resource/resmgr/Standards/NENA-REQ-002.1-2016_NGDataMg.pdf

CAD vs. NG9-1-1 Validations

CAD Validations

- To ensure an address point is present in the CAD database
- May be Spatial or Tabular – depending on the CAD vendor
- CAD database may not be using city or county GIS data – CAD administrator may receive notifications of new address, new streets, new business names, etc. but may not have the time to enter the system in a timely manner
- *Post-call decision making*

NG9-1-1 Validation

- Tabular– GIS to MSAG / GIS to ALI comparison
 - Spatial
 - Points
 - Lines
 - Polygons
 - Topology
- *Pre-call decision making in NG9-1-1*

Validations aren't just Tabular

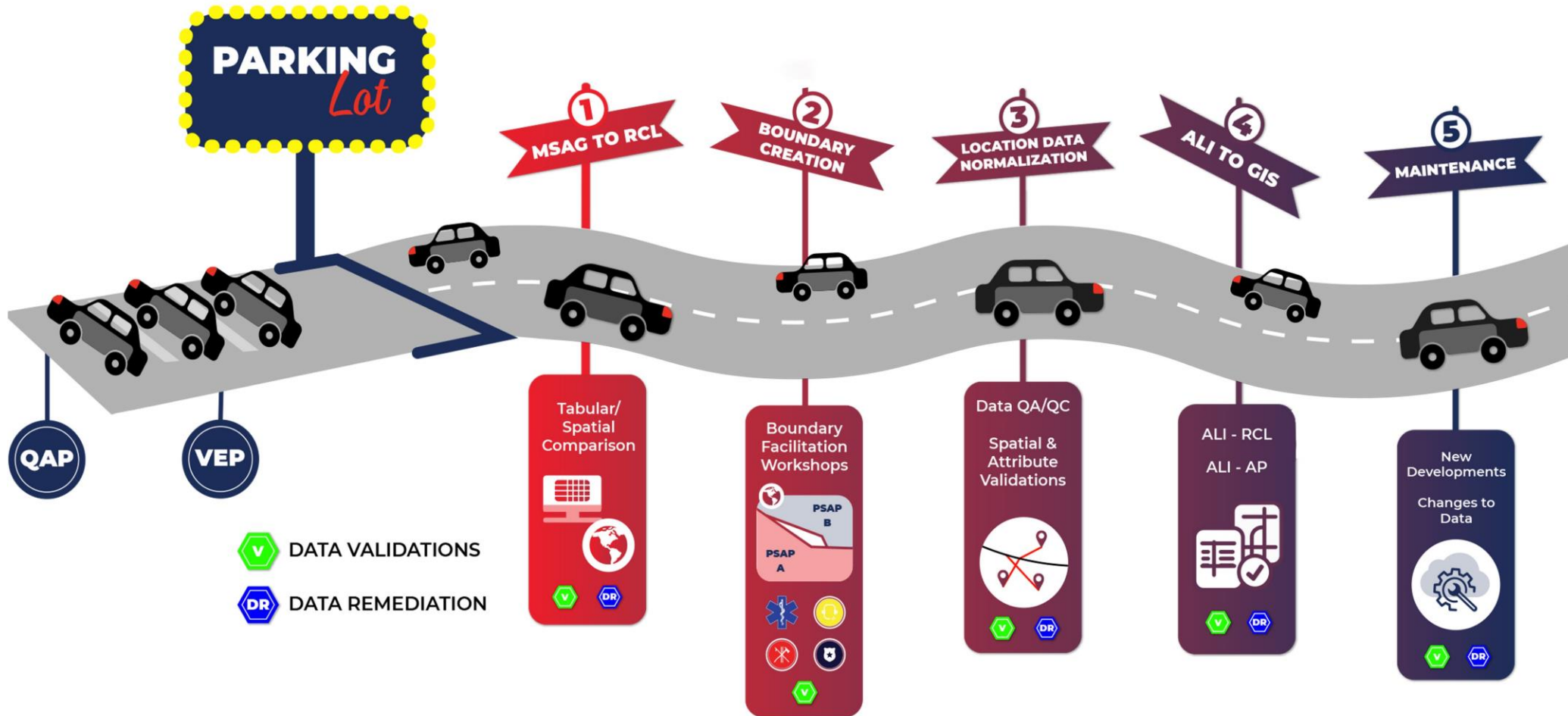
GIS to MSAG/ALI

Road Centerline to MSAG

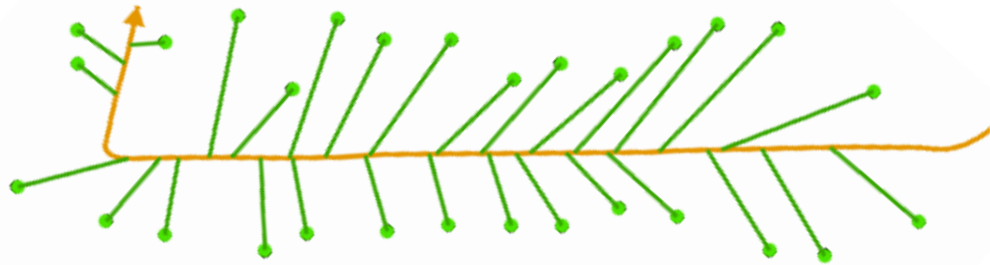
- Does what exist in the MSAG also exist in the Road Centerline layer?
- Do address ranges match?
- Road names – consistent?
- Road Type – abbreviation or spelled out?
 - Consistent – AV, AVE, Avenue, ST, STR, Street

Address Point to ALI

- Do address points fall within the road address range?
- 1:1 match?
- Sub-addressing?
- More accurate – ALI or GIS?

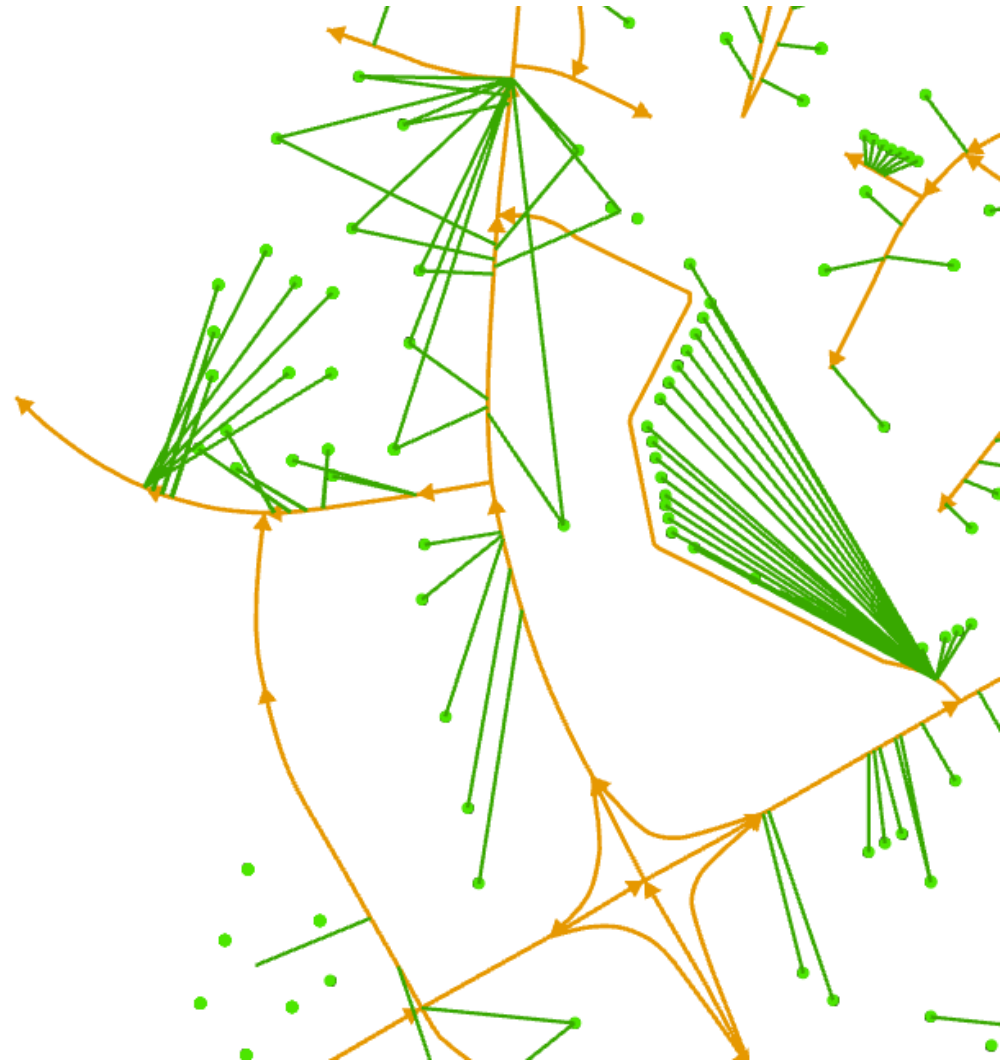


Location Data Validation: Fishbone Analysis



Things to consider:

- Road Name consistency
- RCL Ranges
- Duplicate RCL Naming and ranges

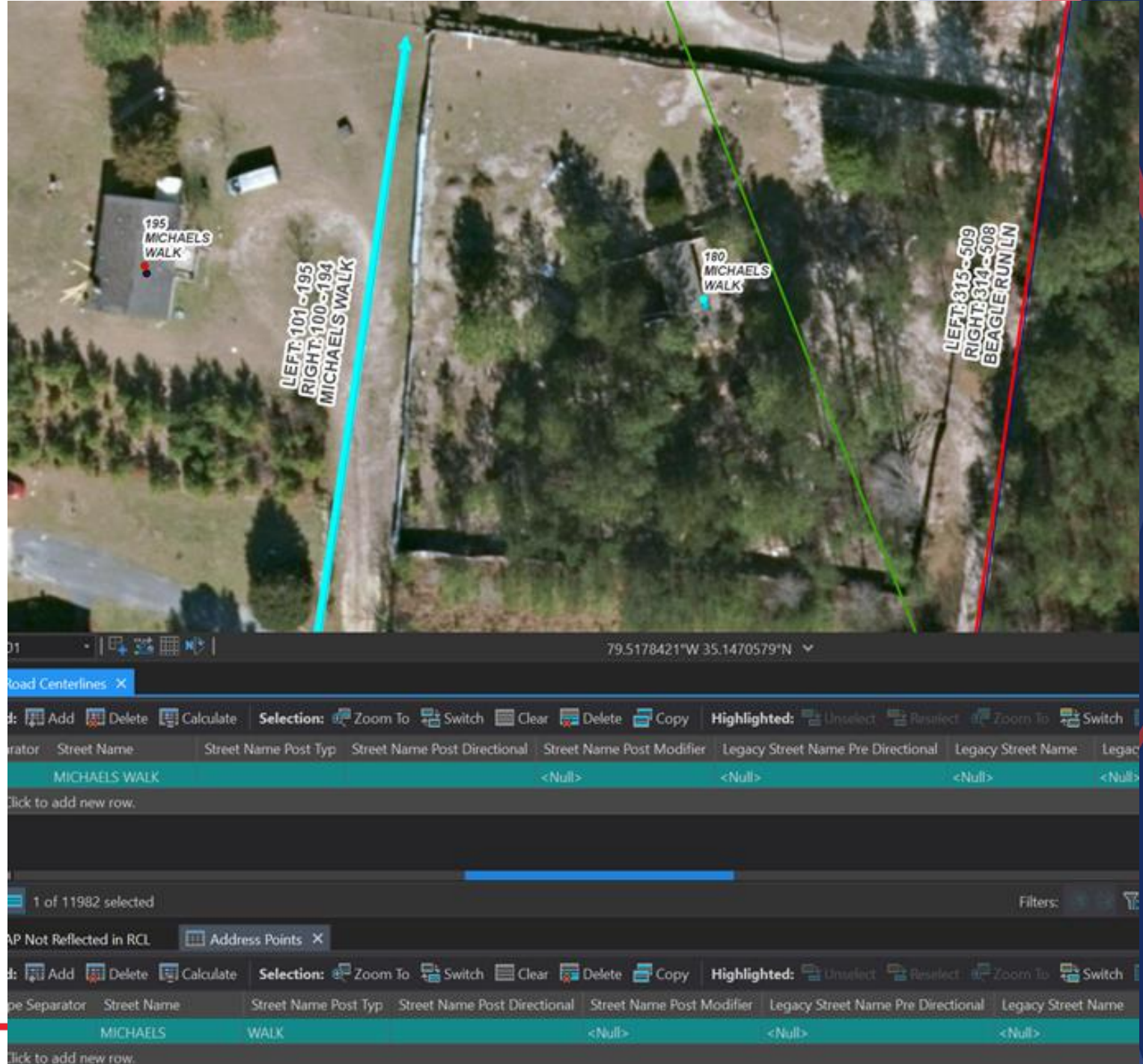


Location Data Validation: Address Point Duplication

- Should not be necessary when sub-address information is added
- Maybe an indicator of problematic addressing, not just a GIS issue

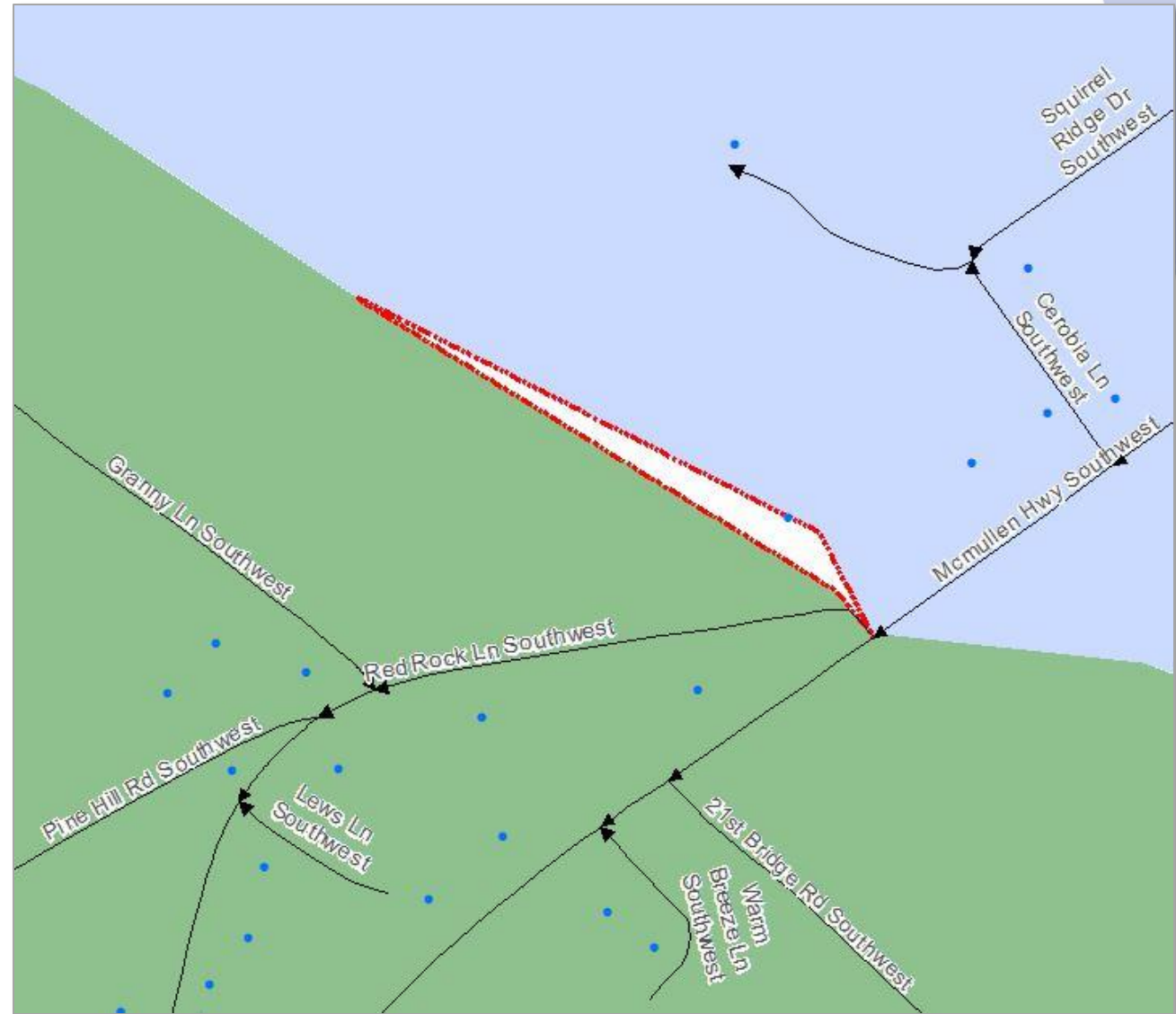
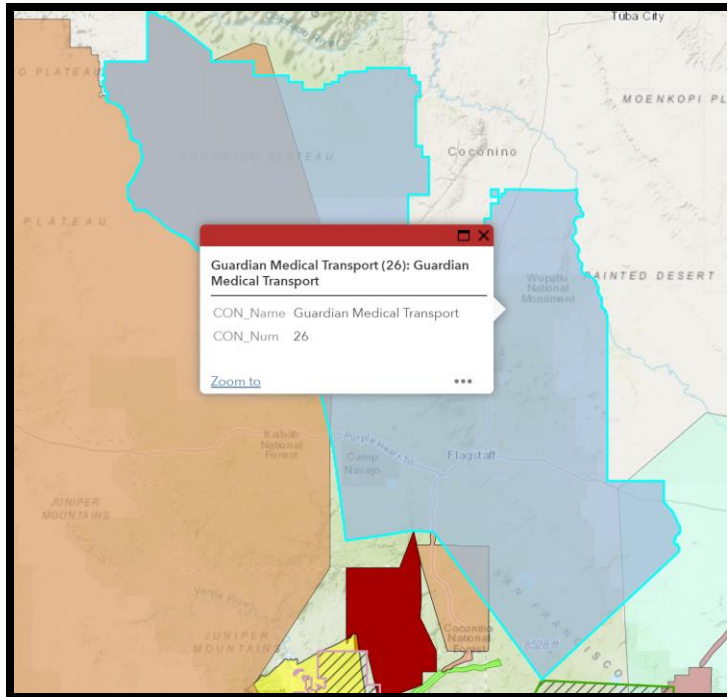


Location Data Validation: AP Not Reflected in RCL



Gaps and Overlaps

- What happens when an address point falls in a gap?



Reconciliation of GIS Data is Life-Critical

Delays resulting from incorrect 9-1-1 call routing or difficulties in location verification are life-threatening.

With NG9-1-1:

- 98% synchronization accuracy in NENA's recommendation for MSAG and ALI databases alone does not produce **"public safety grade" GIS data**, but is a start.
- At only 98% synchronization accuracy, errors may include:
 - PSAP boundary gaps and overlaps.
 - Missing road centerline breaks.
 - Duplication of address points.

GIS data synchronization for NG9-1-1 must go beyond 98% for proper call routing.

- More in-depth spatial comparisons such as fishbone analyses are required for the NGCS (Next Generation Core Services).

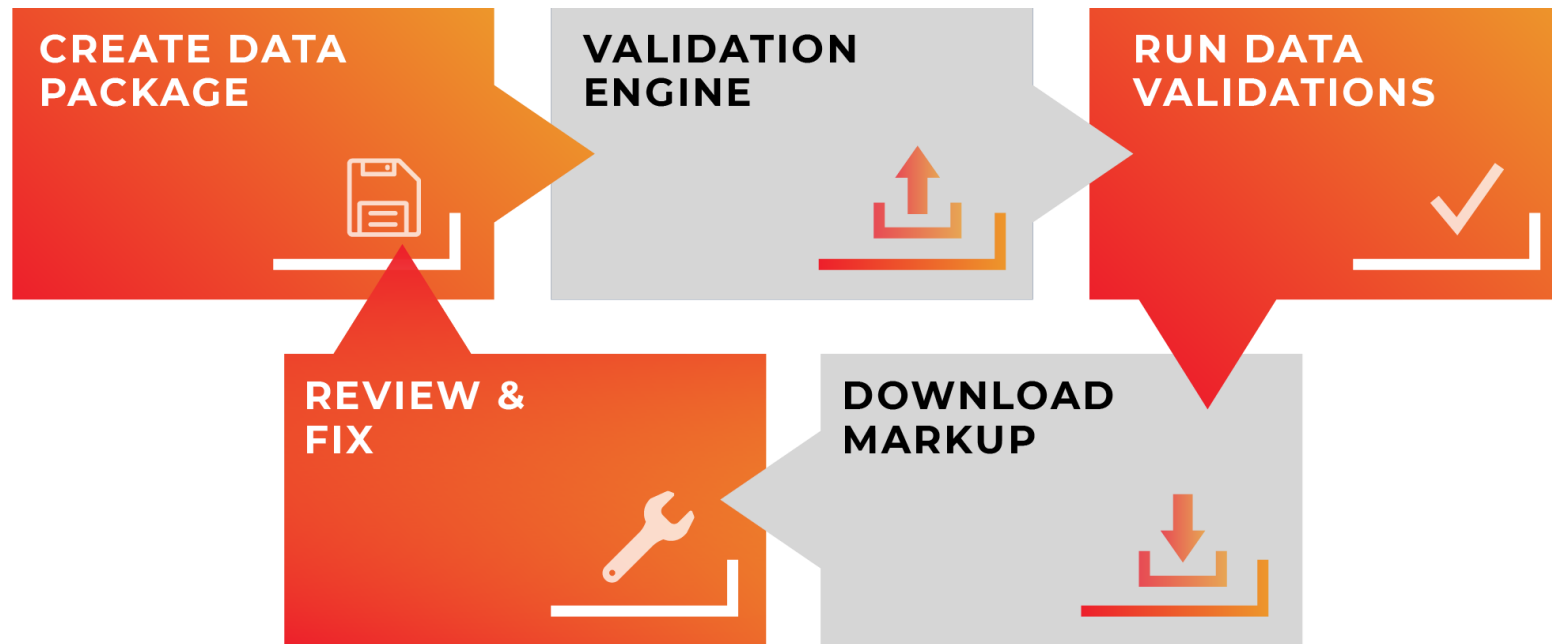
Error Resolution

- NENA requires data error resolution within **3 business days**
- What does this mean for you?



Data Maintenance

- Integrated into Workflow – Data remediation to meet and exceed NENA standards is never complete.
- Cyclical Process



CLOSE THE GAPS TO CREATE SEAMLESS DATA

DATAMARK VEP facilitates the alignment of NG9-1-1 data along neighboring jurisdiction borders to remove gaps and overlaps.



GAPS



OVERLAPS



DUPLICATIVE
DATA

DATAMARK Value Add

VALIDATE - EDIT - PROVISION

To address the broad range of requirements for local, regional, and state GIS stakeholders, DATAMARK VEP is offered in three subscription models. Each subscription can be securely accessed from anywhere and do not require additional licenses or hardware.

VALIDATOR

- Validate and Aggregate GIS, MSAG, and ALI Data
- Identify spatial anomalies and discrepancies within data sets
- Supports GIS industry best practices
- Run quality control checks on-demand

EDITOR

- Web-based editing (no additional licenses or hardware required)
- Enables users to create, maintain, update, validate, & export GIS data
- Empowers GIS departments with limited resources

AGGREGATOR

- Consolidate GIS data from multiple jurisdictions into a single database
- Perform cross-jurisdictional validations
- Identify anomalies and aggregate datasets
- Streamline datasets across platforms (E9-1-1, CAD, etc.)
- Collaborative anomaly management and robust reporting

KEY FEATURES



HIGHLY
CONFIGURABLE



PLATFORM
INDEPENDENT



DEDICATED
SUPPORT



EXTENSIVE
VALIDATIONS

WORK-FROM-HOME APPROVED

As a true cloud-native solution, DATAMARK VEP can be accessed safely from anywhere with a secure browser connection. Whether you're working from home or vacationing around the world, DATAMARK VEP can be right there with you. No additional hardware or licensing required.

"Nobody was thinking about working from home because of a global pandemic when we picked VEP. We're glad we picked a cloud solution because we have been able to continue our work flows without interruption, even working outside the office."

- Glenna Campana, Manatee County, FL



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