

Martin County, FL

Quote for GIS Services



2021 February 12

911 Datamaster, Inc.

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Confidential & Proprietary Information.

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1 Project Background

Geographic Information System (GIS) data is 'the' critical element for any successful deployment and operation of a NG9-1-1 geospatial routing solution that relies upon using a Location Validation Function (LVF) and Emergency Call Routing Function (ECRF). However, before GIS data can be used in this live geospatial call-routing environment, it is vital that it is evaluated by dependable quality assurance (QA) / quality control (QC) processes to verify its completeness and accuracy and that each graphical feature has sound geometry and attribution to conform to the many format and quality requirements. Additionally, the data must also be reconciled with the Automatic Location Identification (ALI) / Master Street Address Guide (MSAG) to make sure all appropriate address points (APs) and road centerlines (RCLs) are present and correctly represented. Unless this work is performed regularly and consistently, inaccurate or incomplete spatial data can result in incorrect call routing.

Martin County, FL has requested **911DM** provide a quote for GIS Data Remediation on Road Centerlines (RCLs) to prepare their data for use in the NG9-1-1 environment.

2 NG9-1-1 GIS Data Solution Overview

The preliminary analysis that follows provides a high-level view of existing data conditions that require closer examination, validation and potential remediation.

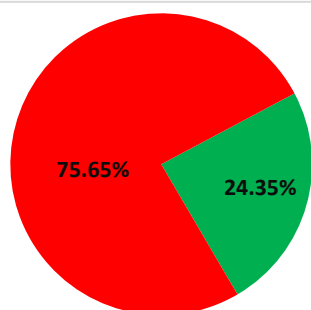


RCL Geometry and Attribution

While not as precise as address points, Road Centerlines (RCLs) are a basic layer for use in determining an address location when an AP is not available in a GIS database. The following validation checks have been performed for the RCL data provided, with regards to the RCLs themselves as well as when compared to the Address Point (AP) and Polygon layers.

Feature Count	Validation Type	# of Features with Potential Errors	% of Features with Potential Errors
8,200	500 - Empty (Null) Geometry	0	0.00%
	501 - Geometry Overlap	4	0.05%
	502 - Address Range Gap	0	0.00%
	503 - Address Range Overlap	663	8.09%
	504 - Address Range Zero	1864	22.73%
	505 - Cutback Angle	1	0.01%
	506 - Not In Polygon	144	1.76%
	507 - Low vs. High Range	20	0.24%
	508 - Parity Inconsistency	71	0.87%
	509 - Polygon Boundary Split	145	1.77%
	510 - RCL Disconnect	106	1.29%
	511 - RCL Intersection Split	169	2.06%
	512 - RCL Pointing In Wrong Direction	629	7.67%
	513 - RCL to Polygon Attribute Mismatch	48	0.59%
	514 - RCL to RCL Attribute Mismatch	3	0.04%
	515 - Short Segment	1	0.01%
	516 - Address Range Out Of Sequence	3813	46.50%
	517 - No USPS Standard Abbreviation Match	200	2.44%
	518 - Duplicate Address Attributes	90	1.10%
	519 - Multipart Geometry	1	0.01%
	520 - True Curve Geometry	0	0.00%
	599 - Required Field Values Missing	56	0.68%
1,997	Features with No Potential Errors (24.35%)		

SUMMARY OF RESULTS



- Features without Potential Errors
- Features with Potential Errors

3 Project Details

3.1 Road Centerline (RCL) Remediation

1. RCLs represent geographic rights-of-way and hold extensive attribute data. Incorrect geometry or attribution of RCL data can return erroneous results that might delay call routing or even cause misrouted calls. 911DM's extensive validation process reviews existing RCL data to identify and adjust potential errors that can negatively impact call routing.

3.2 Deliverables

1. Adjusted RCL GIS layers in Esri 'File' Geodatabase format will be provided. These adjustments will be made by one or more **911DM** analysts that will be either be given remote access to MARTIN COUNTY's Esri environment or allowed to work remotely on subsets of MARTIN COUNTY data.
2. A consultation discussion to review findings with MARTIN COUNTY and 'next step' GIS recommendations will be offered by **911DM** after this phase of the project. It is the responsibility of MARTIN COUNTY to review and accept all **911DM** delivered data, including associated 'adjustments', on a regular basis as increments of work are completed.

3.3 Methodology

1. MARTIN COUNTY will provide **911DM** with a copy of GIS layers in Esri 'File' Geodatabase.
2. **911DM** will remotely perform analysis and corrective action.
3. MARTIN COUNTY will be available by telephone and email for ongoing consultation to support **911DM's** corrective actions.
4. **911DM** will deliver the corrected layers to MARTIN COUNTY along with support on how to re-introduce them back into MARTIN COUNTY's Esri environment and review features requiring local knowledge.
5. MARTIN COUNTY's signature on the project acceptance sign-off form acknowledging receipt of all deliverables shall mark the end of this project.

3.4 Assumptions

- **911DM** will have direct access to MARTIN COUNTY subject matter experts (SMEs) to discuss specifics with regards to schemas, data contents, local GIS practices, and so on.
- MARTIN COUNTY will respond to all requests for clarification of data structure, data content, and data desired end state within two business days of any such requests from **911DM**. MARTIN COUNTY will provide a listing of MARTIN COUNTY employees involved in the process.
- **911DM** will not perform any field verifications but will make **MARTIN COUNTY** aware of issues that may require field verification.
- Potential errors requiring local knowledge and / or field verification will be noted as Pending errors to be reviewed and resolved by **MARTIN COUNTY** later. Pending errors will not hold up the conclusion of this GIS project but may delay the beginning of a subsequent phase that is dependent on these data adjustments.
- **911DM** may use third-party data (for example, county boundaries or aerial imagery) to assist with data adjustments. **911DM** will consult with MARTIN COUNTY over preferred sources for such third-party data. Any incremental cost for third-party data will be billed to **MARTIN COUNTY**.

- **911DM** will adjust RCLs to eliminate the potential errors (either by adjustment or by marking them as pending for staff to assist with local knowledge) if other dependent data does not change. For example, if ESZ polygons are adjusted after we complete work on RCLs, we will not perform revalidation or further adjustments without an amendment to this agreement.
- **MARTIN COUNTY** will provide coordination with any city or other political entity that self-manages their GIS data. MARTIN COUNTY will be the conduit for any adjustments that **911DM** performs.
- **MARTIN COUNTY** will provide definitive information with regards to PSAP, ESZ and responder boundaries.

Thank you for giving us the opportunity to provide this quote. This quote is valid for 90 days. To execute this agreement contingent on availability of funds. Please sign and date below. Return a copy via fax or email to:

Jim Shepard
Email jims@911Datamaster.com
Phone 512.656.7713
Fax: 913-469-6401

This quote becomes contractual upon execution and signing by both.

Agreed by MARTIN COUNTY by:

Agreed by 911 Datamaster by:

Name

Name

Title

Title

Date

Date

Customer agrees to the terms of this paragraph when signing where indicated above.

NOTE: 911 Datamaster, Inc. provides no guarantee as to the required completeness, correctness and timeliness of the data it adjusts and provides back to the Data Provider. Data Provider, therefore, accepts all liability for any and all errors in data received from 911 Datamaster. Accordingly, Data Provider hereby irrevocably releases and holds harmless 911 Datamaster Inc., and waives any and all present or future claims, damages, losses, expenses, liabilities and causes of action arising from the development, implementation or use of any data adjusted by 911 Datamaster and provided back to them.

ATTEST:

BOARD OF COUNTY COMMISSIONERS
MARTIN COUNTY, FLORIDA

CAROLYN TIMMANN, CLERK OF THE
CIRCUIT COURT AND COMPTROLLER

STACEY HETHERINGTON, CHAIR

APPROVED AS TO FORM & LEGAL SUFFICIENCY:

SARAH W. WOODS, COUNTY ATTORNEY

Data Management Disclaimer

MARTIN COUNTY 9-1-1 ("Customer") acknowledges that it has requested that 911 Datamaster, Inc. ("Datamaster") perform modifications and management of 9-1-1 related data, namely Customer records / Master Street Address Guide and GIS data. The modifications will be based on specific guidance from Customer.

Customer further acknowledges that the decision was made solely by Customer for its own business purposes and that utilization of modified data implies and obligates Customer to perform a review of affected data upon completion.

Customer, therefore, accepts all liability for the modification and management of data. Accordingly, Customer hereby irrevocably releases and holds harmless Datamaster, and waives any and all present or future claims, damages, losses, expenses, liabilities and causes of action arising from the modification and management of 9-1-1 data.

Customer agrees to the terms of this paragraph by submitting modification requests and utilizing the data as modified by Datamaster. Nothing in this Disclaimer warrants the actions conducted on the Customer's data nor does it guarantee any minimum level of throughput for requested changes.

Signature

Title

Date

Preliminary GIS Data Assessment



GIS Data Assessment prepared for **MARTIN COUNTY, FL**

**A Confidential / Proprietary Document
February 02, 2021**

NOTE: 911 Datamaster makes no claim as to the results of any analysis, using data provisioned by the data provider, regarding its completeness, correctness or timeliness. All analysis results indicating 'potential' data issues should be considered as recommendations for the data provider to review and make corrections where appropriate. Data provider, therefore, accepts all liability for the potential errors indicated in their submitted data. Accordingly, data provider hereby irrevocably releases and holds harmless 911 Datamaster, and waives any and all present or future claims, damages, losses, expenses, liabilities and causes of action arising from the development, implementation or use of any data submitted for analysis or the results provided to them.

NG 9-1-1 Routability Metrics

Address Points (AP) are a precise way of reflecting a single 9-1-1 address location in a GIS database. The following validation checks have been performed for the AP data provided, with regards to the APs themselves as well as when compared to the Polygon layers.

1. APs with Empty (Null) Geometry
2. APs Not Covered by Polygons
3. APs in Multiple Polygons
4. AP Required Field Values Missing
5. AP Attribute Has No USPS Standard Abbreviation Match

While not as precise as address points, Road Centerlines (RCLs) are a basic layer for use in determining an address location when an address point for a location lookup is not available in a GIS database. The following validation checks have been performed for the RCL data provided, with regards to the RCLs themselves as well as when compared to the Polygon layers.

6. RCLs with Empty (Null) Geometry
7. RCLs Not Covered by Polygon
8. RCL Required Field Values Missing
9. RCL Attribute Has No USPS Standard Abbreviation Match
10. RCL Address Range '0'
11. RCL Address Range Overlap

PSAP, ESZ and or Law/Fire/EMS polygons provide required information that is needed for use in determining a PSAP to route a call to as well the emergency responders for that locations. The following validation checks have been performed for each Polygon data layer provided.

12. Polygons with Empty (Null) Geometry
13. Polygons with Geometry Gaps
14. Polygons with Geometry Overlaps
15. Required Field Values Missing

Routability Report Card

GRADES BY FEATURE CLASS

- A** No Critical Issues found in AP, RCL, PSAP, ESN, Fire, Law, or EMS features
- B** Less than 10% of AP or RCL features have Critical Issues
- C** 10% or more of AP or RCL features have Critical Issues

OR

PSAP, ESN, Fire, Law and/or EMS features provide required information that is needed for use in determining a PSAP to route a call to as well as the emergency responders for that location. Any Critical issues found in these layers must be addressed prior to using data for call routing in ECRF.

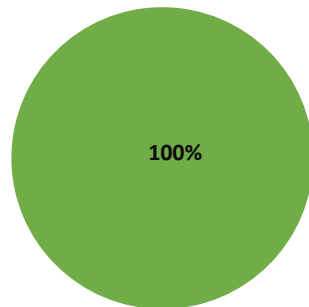
ROUTABILITY RESULTS		
Layer Type	% Features with Errors	Current Critical Issues
AP	0.17%	<ul style="list-style-type: none"> - Not in Polygon - No USPS Standard Abbreviation Match - Required Field Values Missing
EMS	0.00%	
Fire	0.00%	
Law	0.00%	
PSAP	0.00%	
RCL	33.85%	<ul style="list-style-type: none"> - Address Range Overlap - Address Range Zero - Not in Polygon - No USPS Standard Abbreviation Match - Required Field Values Missing



Polygon Geometry and Attribution: PSAP Layer

Feature Count	Validation Type	# of Features with Potential Errors	% of Features with Potential Errors
2	600 - Empty (Null) Geometry	0	0.00%
	601 - Geometry Overlap	0	0.00%
	602 - Geometry Gap	0	0.00%
	603 - No Coincident Vertices	0	0.00%
	699 - Required Field Values Missing	0	0.00%
2 Features with No Errors (100%)			

SUMMARY OF RESULTS



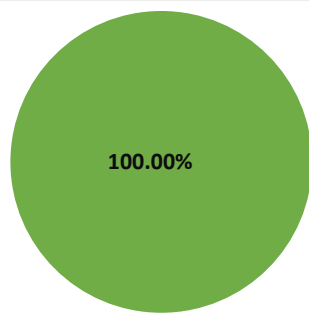
- Features without Potential Errors
- Features with Potential Errors

SpatialStation® Polygon Geometry and Attribution: Provisioning

Boundary Layer

Feature Count	Validation Type	# of Features with Potential Errors	% of Features with Potential Errors
1	600 - Empty (Null) Geometry	0	0.00%
	601 - Geometry Overlap	0	0.00%
	602 - Geometry Gap	0	0.00%
	603 - No Coincident Vertices	0	0.00%
	699 - Required Field Values Missing	0	0.00%
1 Features with No Errors (100.00%)			

SUMMARY OF RESULTS



- Features without Potential Errors
- Features with Potential Errors

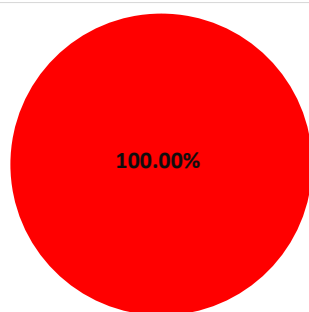
SpatialStation® Polygon Geometry and Attribution:

Muni

Boundary Layer

Feature Count	Validation Type	# of Features with Potential Errors	% of Features with Potential Errors
6	600 - Empty (Null) Geometry	0	0.00%
	601 - Geometry Overlap	6	100.00%
	602 - Geometry Gap	6	100.00%
	603 - No Coincident Vertices	6	100.00%
	699 - Required Field Values Missing	0	0.00%
0 Features with No Errors (0.00%)			

SUMMARY OF RESULTS



- Features without Potential Errors
- Features with Potential Errors



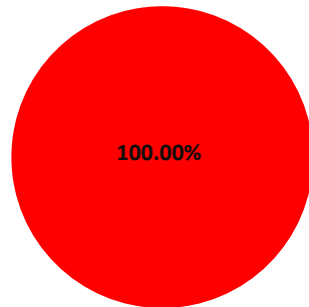
Polygon Geometry and Attribution:

MSAGComm

Boundary Layer

Feature Count	Validation Type	# of Features with Potential Errors	% of Features with Potential Errors
16	600 - Empty (Null) Geometry	0	0.00%
	601 - Geometry Overlap	0	0.00%
	602 - Geometry Gap	0	0.00%
	603 - No Coincident Vertices	1	6.25%
	699 - Required Field Values Missing	16	100.00%
0 Features with No Errors (0.00%)			

SUMMARY OF RESULTS



- Features without Potential Errors
- Features with Potential Errors



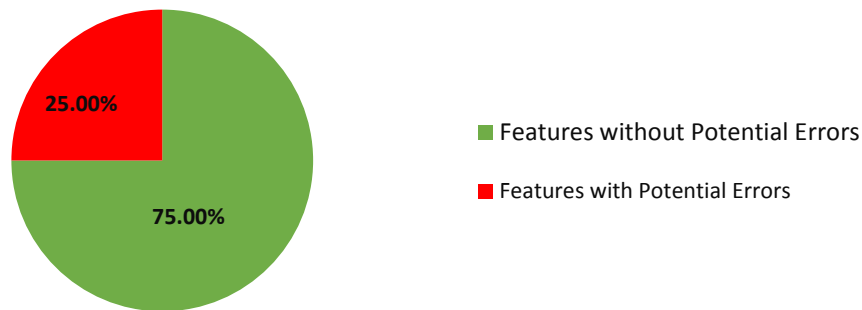
Polygon Geometry and Attribution:

LawORI

Boundary Layer

Feature Count	Validation Type	# of Features with Potential Errors	% of Features with Potential Errors
4	600 - Empty (Null) Geometry	0	0.00%
	601 - Geometry Overlap	0	0.00%
	602 - Geometry Gap	0	0.00%
	603 - No Coincident Vertices	1	25.00%
	699 - Required Field Values Missing	0	0.00%
3 Features with No Errors (75%)			

SUMMARY OF RESULTS



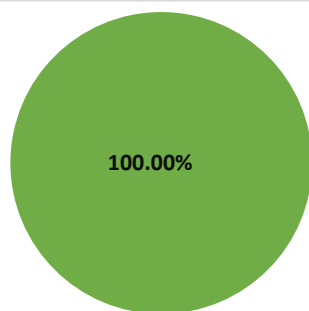


Polygon Geometry and Attribution:

Fire Boundary Layer

Feature Count	Validation Type	# of Features with Potential Errors	% of Features with Potential Errors
2	600 - Empty (Null) Geometry	0	0.00%
	601 - Geometry Overlap	0	0.00%
	602 - Geometry Gap	0	0.00%
	603 - No Coincident Vertices	0	0.00%
	699 - Required Field Values Missing	0	0.00%
2 Features with No Errors (100.00%)			

SUMMARY OF RESULTS



■ Features without Potential Errors

■ Features with Potential Errors

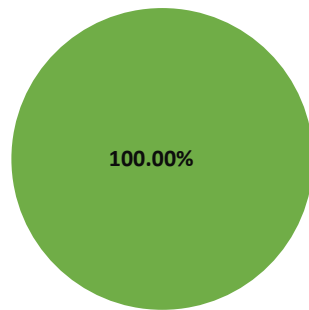


Polygon Geometry and Attribution:

EMS Boundary Layer

Feature Count	Validation Type	# of Features with Potential Errors	% of Features with Potential Errors
2	600 - Empty (Null) Geometry	0	0.00%
	601 - Geometry Overlap	0	0.00%
	602 - Geometry Gap	0	0.00%
	603 - No Coincident Vertices	0	0.00%
	699 - Required Field Values Missing	0	0.00%
2 Features with No Errors (100.00%)			

SUMMARY OF RESULTS



■ Features without Potential Errors

■ Features with Potential Errors

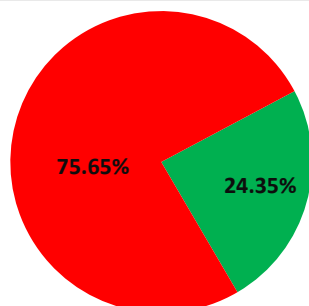


RCL Geometry and Attribution

While not as precise as address points, Road Centerlines (RCLs) are a basic layer for use in determining an address location when an address point is not available in a GIS database. The following validation checks have been performed for the RCL data provided, with regards to the RCLs themselves as well as when compared to the Address Point (AP) and Polygon layers. Three major categories of analyses are typically performed on RCL data: Geometry Analysis, Attribution Analysis and Tabular Database Comparison Analysis. Below are the results of the Geometry and Attribution analyses.

Feature Count	Validation Type	# of Features with Potential Errors	% of Features with Potential Errors
8,200	500 - Empty (Null) Geometry	0	0.00%
	501 - Geometry Overlap	4	0.05%
	502 - Address Range Gap	0	0.00%
	503 - Address Range Overlap	663	8.09%
	504 - Address Range Zero	1864	22.73%
	505 - Cutback Angle	1	0.01%
	506 - Not In Polygon	144	1.76%
	507 - Low vs. High Range	20	0.24%
	508 - Parity Inconsistency	71	0.87%
	509 - Polygon Boundary Split	145	1.77%
	510 - RCL Disconnect	106	1.29%
	511 - RCL Intersection Split	169	2.06%
	512 - RCL Pointing In Wrong Direction	629	7.67%
	513 - RCL to Polygon Attribute Mismatch	48	0.59%
	514 - RCL to RCL Attribute Mismatch	3	0.04%
	515 - Short Segment	1	0.01%
	516 - Address Range Out Of Sequence	3813	46.50%
	517 - No USPS Standard Abbreviation Match	200	2.44%
	518 - Duplicate Address Attributes	90	1.10%
	519 - Multipart Geometry	1	0.01%
	520 - True Curve Geometry	0	0.00%
	599 - Required Field Values Missing	56	0.68%
1,997	Features with No Potential Errors (24.35%)		

SUMMARY OF RESULTS



- Features without Potential Errors
- Features with Potential Errors

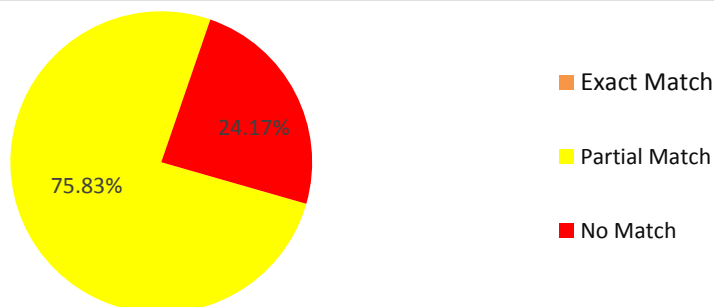
MSAG to RCL Comparison

The MSAG to RCL comparison checks highlight any inconsistencies between the street names and ranges present in the MSAG and those in the GIS RCLs. This analysis identifies how many one or more partial matches exist between MSAG records and RCLs. Those fields **highlighted** in the list below are required in the GIS data for partial match detection. RCL records that do not contain the required values will not be considered for partial matches and identified as no match.

1. Low Range (lowest address number)
2. High Range (highest address number)
3. Prefix Directional
4. **Street Name**
5. Street Type
6. Post Directional
7. OEB (Odd, Even, or Both addressing)
8. **Community Name**
9. **County Code**
10. **State**
11. ESN #

Feature Count	Comparison Type	Occurrence Count	Occurrence %
8,200		3,219	
	5020 – MSAG to Contiguous RCL - Exact Matches	0	0.00%
	5021 – MSAG to Contiguous RCL - Partial Matches	2,441	75.83%
	5022 -- MSAG to Contiguous RCL - No Matches	778	24.17%

SUMMARY OF RESULTS



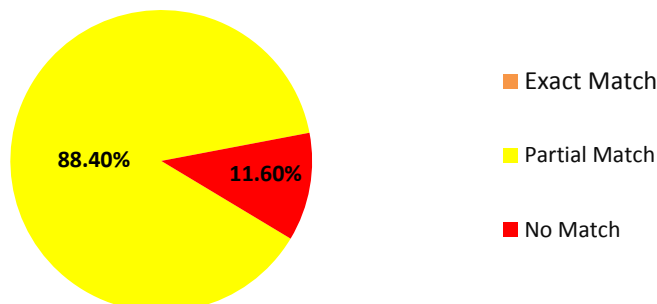
RCL to MSAG Comparison

The RCL to MSAG comparison checks identify those RCLs not represented in the MSAG. This analysis identifies how many one or more partial matches exist between MSAG records and RCLs. Those fields **highlighted** in the list below are required in the GIS data for partial match detection. RCL records that do not contain the required values will not be considered for partial matches and identified as no match.

1. Low Range (lowest address number)
2. High Range (highest address number)
3. Prefix Directional
4. **Street Name**
5. Street Type
6. Post Directional
7. OEB (Odd, Even, or Both addressing)
8. **Community Name**
9. **County Code**
10. **State**
11. ESN #

Feature Count	Comparison Type	Occurrence Count	Occurrence %
8,200		9,587	
	5010 - Contiguous RCL to MSAG - Exact Matches	0	0.00%
	5011 - Contiguous RCL to MSAG - Partial Matches	8,475	88.40%
	5012 - Contiguous RCL to MSAG - No Matches	1,112	11.60%

SUMMARY OF RESULTS

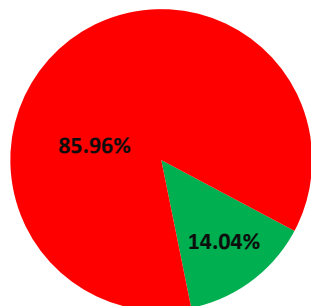


AP Geometry and Attribution

Address Points (AP) are a precise way of reflecting a single 9-1-1 address location in a GIS database. The following validation checks have been performed for the AP data provided, with regards to the APs themselves as well as when compared to the Road Center Line (RCL) and Polygon layers. Three major categories of analyses are typically performed on AP data: Geometry Analysis, Attribution Analysis and Tabular Database Comparison Analysis. Below are the results of the Geometry and Attribution analyses.

Feature Count	Validation Type	# of Features with Potential Errors	% of Features with Potential Errors
88,917	400 - Empty (Null) Geometry	0	0.00%
	401 - Geometry Overlap	18439	20.74%
	402 - AP Out of Sequence	6564	7.38%
	403 - AP to Polygon Attribute Mismatch	241	0.27%
	404 - AP to RCL Attribute Mismatch	31138	35.02%
	405 - Coincident with RCL	25	0.03%
	406 - Not In Polygon	3	0.00%
	407 - In Multiple Polygons	0	0.00%
	408 - Parity Mismatch	40838	45.93%
	409 - No USPS Standard Abbreviation Match	22	0.02%
	410 - Duplicate Address Attributes	451	0.51%
	499 - Required Field Values Missing	124	0.14%
12,485	Features with No Potential Errors (14.04%)		

SUMMARY OF RESULTS



- Features without Potential Errors
- Features with Potential Errors

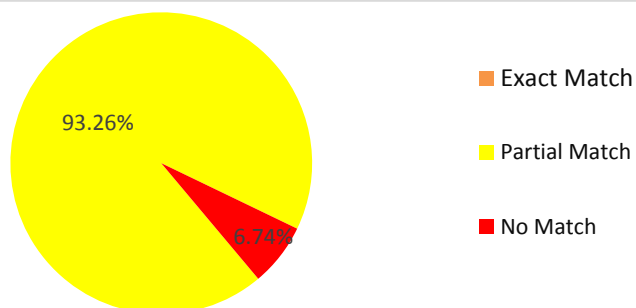
ALI to AP Comparison

Ideally every unique ALI address will have an AP address that can be used for locating an emergency call. The unique ALI address to AP address comparison checks identify any inconsistencies between the addresses present in the ALI and those in the GIS APs. This comparison specifically identifies how many exact, partial, or no matches exist between ALI database records and APs. The following AP attributes are used for this partial match process. Those fields **highlighted** in the list below are required in the GIS data for partial match detection. AP records that do not contain the required values will not be considered for partial matches and identified as no match.

1. **House #**
2. House # Suffix
3. Prefix Directional
4. **Street Name**
5. Street Suffix
6. Post Directional
7. **Community Name**
8. **County Code**
9. **State**
10. ESN #

Feature Count	Comparison Type	Occurrence Count	Occurrence %
88,917		12,777	
	4001 - ALI Unique Address to AP Address - Exact Matches	0	0.00%
	4002 - ALI Unique Address to AP Address - Partial Matches	11,916	93.26%
	4003 - ALI Unique Address to AP Address - No Matches	861	6.74%

SUMMARY OF RESULTS



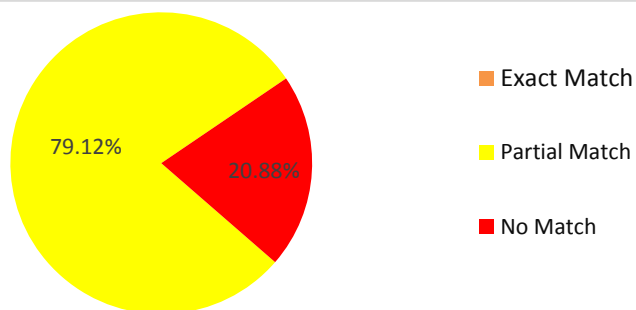
ALI to RCL Comparison

Ideally every unique ALI address will have an RCL address range that can be used for locating an emergency call. The unique ALI address to RCL comparison checks identify any inconsistencies between the addresses present in the ALI and the address ranges in the GIS RCLs. This comparison specifically identifies how many exact, partial, or no matches exist between ALI database records and RCLs. Those fields **highlighted** in the list below are required in the GIS data for partial match detection. RCL records that do not contain the required values will not be considered for partial matches and identified as no match.

1. House # range for left and right sides (both high and low)
2. House # Suffix
3. Prefix Directional
4. Street Name
5. Street Suffix
6. Post Directional
7. Community Name
8. County Code
9. State
10. ESN #

Feature Count	Comparison Type	Occurrence Count	Occurrence %
88,917		12,777	
	4101 - ALI Unique Address to RCL - Exact Matches	0	0.00%
	4102 - ALI Unique Address to RCL - Partial Matches	10,109	79.12%
	4103 - ALI Unique Address to RCL - No Matches	2,668	20.88%

SUMMARY OF RESULTS



Appendix A - Terms, Acronyms

Term	Definition
ALI	Automatic Location Information
AP	Address Point
ECRF	Emergency Call Routing Function
ESN	Emergency Service Number
ESZ	Emergency Service Zone
GIS	Geographic Information System
GIS Data Element	Refers to a single 'point', 'line' or 'polygon' feature in the GIS data
High	Common 9-1-1 reference to the highest numerical value of an address range.
Low	Common 9-1-1 reference to the lowest numerical value of an address range.
LVF	Location Validation Function
MSAG	Master Street Address Guide
PC	Personal Computer
RCL	Road Centerline
SPS	SpatialStation

Appendix B – Analysis Examples

AP Geometry Analysis

APs with Empty (Null) Geometry — Code 400

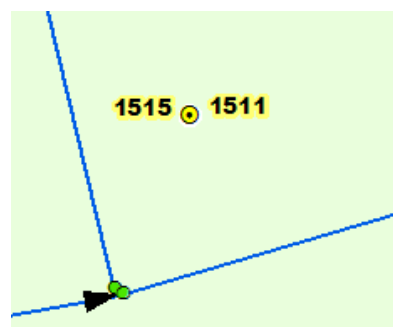
Null geometry can be created unintentionally by users or software. Null geometry essentially means a tabular record is represented in a map database without a graphic representation.

Impact: Records that lack geometry cannot be shown on a map or used for geocoding.

AP Geometry Overlap — Code 401

Address points that are on top of one another, or that are too tightly grouped together, are identified for review. Perfectly coincident APs, when on top of each other for example, could have been caused inadvertently in the process of digitizing them.

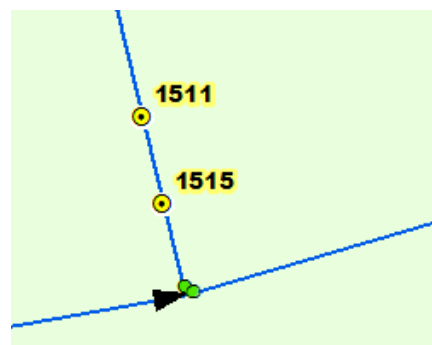
Impact: The stacking of APs can lead to incorrect automated call routing due to poor proximity of points to the actual locations of the structures they represent.



APs Coincident with RCLs — Code 405

APs represent a set of conditions that are found on one or the other side of an RCL. They typically should not coincide with the RCL.

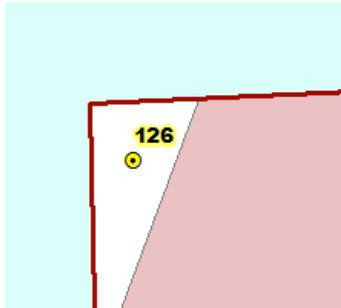
Impact: APs coincident with RCLs could lead to incorrect automated call routing due to poor proximity of points to the actual locations of the structures they represent.



APs Not Covered by Polygons — Code 406

Every AP should be contained within one and only one polygon per configured feature class. Gaps or overlaps in the polygon layer create places where AP to Polygon errors can occur.

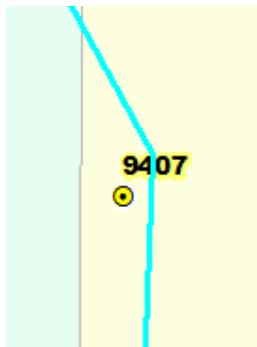
Impact: APs that do not fall within a polygon cannot be used for automated call routing because the process of point-in-polygon determination cannot be completed.



APs in Multiple Polygons — Code 407

APs have a single attribute per polygon that describes its location. This error situation usually indicates that polygons in a feature class are overlapping in error.

Impact: A point cannot be in two places at one time, i.e. two counties at once or two ESZs at once, thus this problem can impact the automated call routing process.

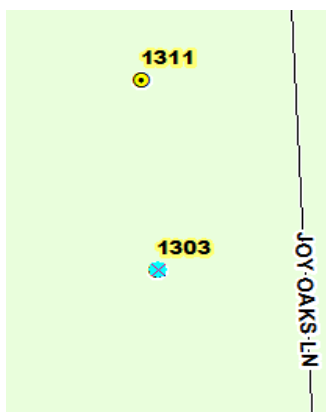


AP Attribution Analysis

AP Out of Sequence — Code 402

This condition occurs when an AP's address number is greater than both its neighboring APs' address numbers, is less than both of its neighboring APs' address numbers or is otherwise not consistent in numbering with its neighbors. This indication that the address number does not follow the expected numerical sequence helps identify problems where an incorrect address may be entered.

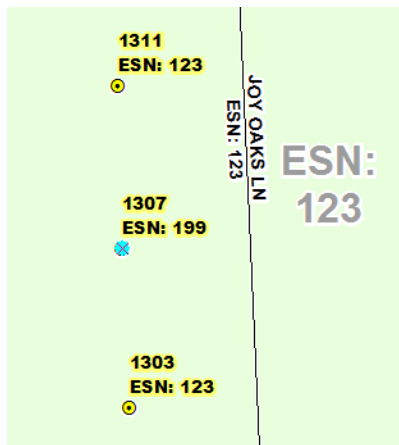
Impact: If a point is incorrectly located, and the situation not corrected, incorrect location identification can occur such as with a point-in-polygon determination, for automated call routing.



AP to Polygon Attribute Mismatch — Code 403

APs often contain attributes that relate information that originates from another feature class. For example, the Community or ESN attributes of an AP describes which polygon features the AP is within. An error condition exists if the attributes that relate to the polygons do not match the polygon's attributes.

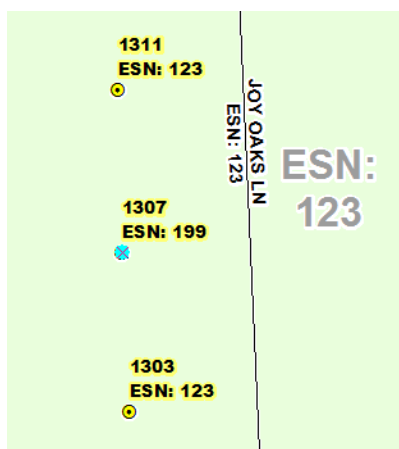
Impact: Not syncing up the attribute data between the APs and polygons can cause a conflict of which attribute is correct, the address point or the polygon attribute.



AP to RCL Attribute Mismatch — Code 404

APs often contain attributes that relate information that originates from another feature class. An AP usually reflects address information associated with the RCL from which it was assigned. When the AP attributes that relate to the RCL do not agree with the attribution of the RCL an error condition exists.

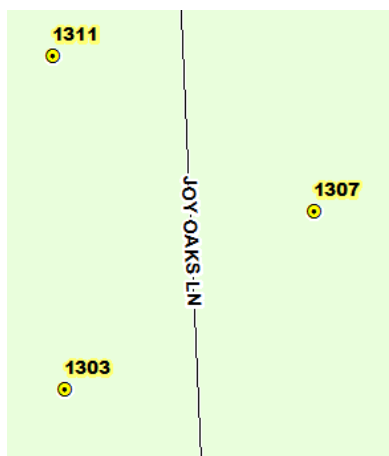
Impact: If the AP is in error and left uncorrected an incorrect attribute could impact the automated call routing process.



AP Parity Mismatch — Code 408

Most addressing systems assign even addresses to one side of a thoroughfare and odd addresses to the other. An even numbered address on the odd side of an RCL usually indicates an error condition. Addressing schemes that do not use parity can be found in communities that use lot numbering schemes for example.

Impact: If the AP location is in error and left uncorrected this problem can impact the automated call routing process. For example, an AP on the wrong side of the road may route incorrectly if it lies within the incorrect PSAP polygon.



AP Attribute Has No USPS Standard Abbreviation Match — Code 409

Identifies a 'Prefix Direction', 'Post Type', or 'Post Direction' abbreviation as not being USPS publication 28 compliant (see Appendix B – References on Postal Standards).

Impact – Non-standard abbreviations can cause problems in NG9-1-1 systems where their values are not recognized. (ex. LVF/ECRF).

AP Has Duplicate Address Attributes — Code 410

Duplicate attribution for two or more APs are present in the same feature class (nulls and zeros are excluded).

Impact - Subaddressing is typically needed to make a more precise determination location and thus avoid feature duplication, which should not be present in an NG9-1-1 system.

Required Field Values Missing — Code 499

A minimum set of attributes needed to accomplish the purpose of the AP feature class is defined. Any feature that does not have complete attribution will be found in error. Note that not all required attributes will have values while others must always contain a value. For example, a directional field may not have a value if none is needed to describe the address, but all APs should have a name field value.

Impact: If critical location information values are missing, such as street name, calls may not geocode properly, or at all.

RCL Geometry Analysis

RCLs with Empty (Null) Geometry — Code 500

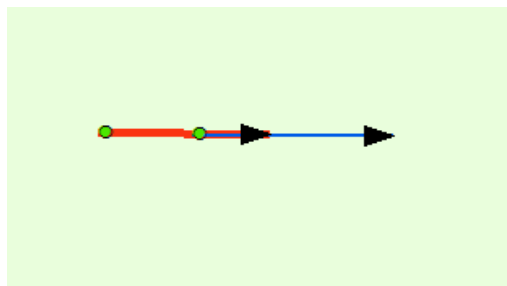
Null geometry can be created unintentionally by users or software. , Null geometry essentially means a tabular record is represented in your map database without a graphic representation.

Impact: Records that lack geometry cannot be shown on a map or used for geocoding.

RCL Geometry Overlap — Code 501

An RCL typically should not physically overlap another except when describing bridges or overpasses. To ensure proper topology development, an RCL should only connect to another RCL at an endpoint.

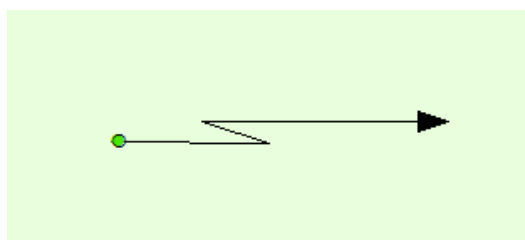
Impact: Overlapping RCLs can reduce spatial accuracy for geocoding purposes as they may be the symptom of RCL segments that are either too long or in the wrong location.



RCL Cutback Angle — Code 505

Cutback angles are computed among the vertices that make up an RCL. If the angle made by vertices in sequence is larger than a threshold, the geometry of the line is suspect. Roadways in the real world have a realistic limit to the sharpness of curves. Geometry that contains angles sharper than the threshold may have been created incorrectly.

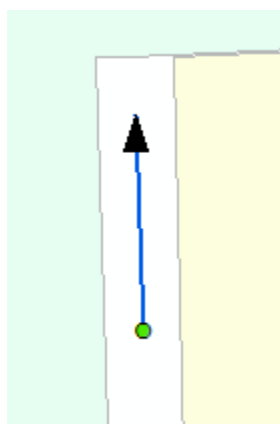
Impact: Additional length to RCLs as well incorrect line direction in these types of errors could create errors in geocoding and subsequent point-in-polygon determinations.



RCLs Not Covered by Polygon — Code 506

Every RCL should be contained within one and only one polygon per configured polygon feature class. Gaps for example in the polygon layer can create places where RCLs are not covered by a polygon and thus an error can occur.

Impact: RCLs that do not fall within a polygon cannot be used for automated call routing because the process of point-in-polygon determination cannot be completed.

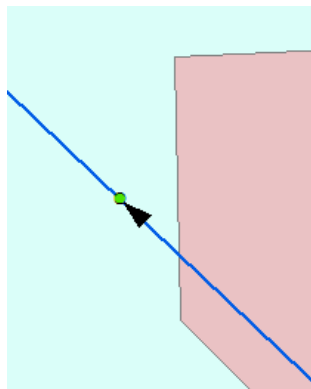


RCLs Not Split at Polygons — Code 509

Polygon features that share related attributes to the RCL are places where RCLs must be segmented to maintain consistent attributes. Where RCLs cross polygons lines, attribution

of the RCLs will need to take in to account the attribution of the polygons within which they lie.

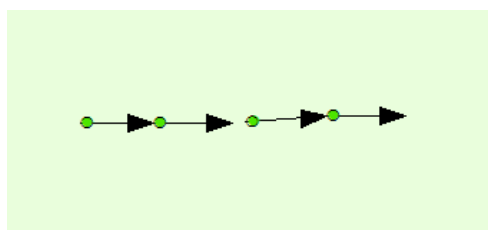
Impact: If an RCL is not completely within a single polygon feature or lies completely along the polygon border, yet has attribution for only one polygon, the attribution of the line may be inconsistent with polygon attribution.



RCL Disconnect — Code 510

To ensure proper topology, an RCL should only connect to another RCL at an endpoint. Connected RCLs should have their endpoints perfectly coincident. Digitizing with incorrect snapping and tolerance settings can create these errors.

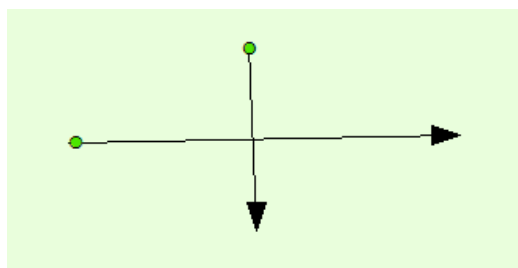
Impact: Improper connectivity between segments can adversely affect some application functionality, such as shortest distance determination along RCLs.



RCLs Not Split at Intersections — Code 511

An RCL should not physically overlap another except when describing bridges or overpasses in some systems. To ensure proper topology, an RCL should only connect to another RCL at an endpoint and be broken at all intersections (unless an overpass or bridge is present).

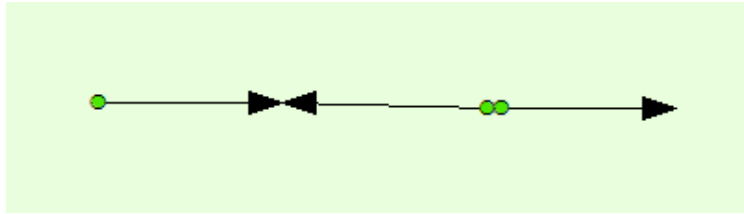
Impact: Roads not broken at intersections can indicate two vertical levels where only one may be present. They can also indicate same level intersections, where there may not be one, when all roads are broken at all intersections. Care must be taken in determining whether roads that intersect should be broken or not when they cross.



RCLs Pointing in Wrong Direction — Code 512

RCL segments that are drafted in a direction inconsistent with contiguous RCL segments are identified. RCLs should 'flow' in the direction of increasing address range attribution.

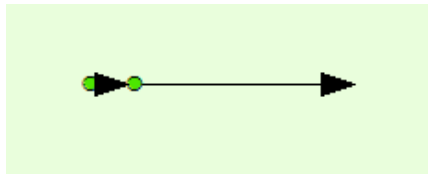
Impact: Incorrect road direction can adversely affect geocoding by executing the process in the wrong direction.



Short Segment — Code 515

RCLs under a certain length may have been created in error and likely do not correctly reflect reality. These should be reviewed and eliminated if unneeded.

Impact: Numerous, unnecessary RCL segments can impact the automated call routing process by potentially extending search/processing time.

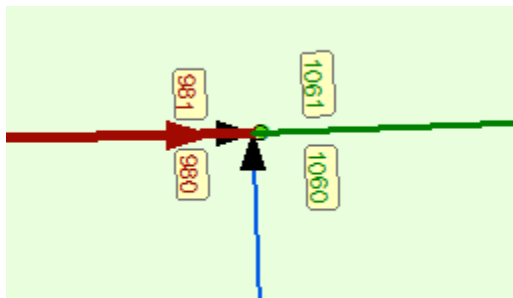


RCL Attribution Analysis

RCL Address Range Gap — Code 502

In addressing systems that use continuous address ranges, any unaccounted for addresses may be an error and should be verified for completeness. An example of a gap is where a line segment's highest address is 980 and the adjoining, continuing segment's lowest address is 1060, leaving addresses between 980 and 1060 unrepresented. Block and range addressing commonly used in developed areas will contain address gaps that are likely not errors.

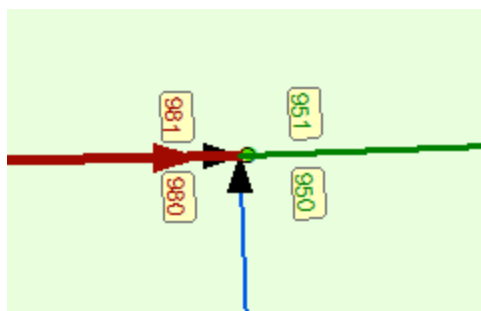
Impact: If the address ranges for an RCL match the actual ranges on the ground then this may actually be considered a problem. In fact, not only is this the preferred representation but improvements in GIS data representation may increase the number of gaps in the RCLs over time.



RCL Address Range Overlap — Code 503

An address should only appear one time in the RCL feature class. Adjoining, contiguous segments are checked to ensure that address ranges do not overlap between them.

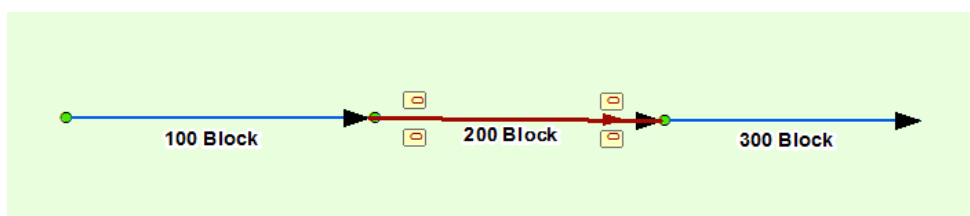
Impact: Incorrect or conflicting information can impact geocoding so that calls may not geocode properly, or at all.



RCL Address Range '0' — Code 504

An address range that has a Lo and Hi attribute value of zero. These are identified as potential errors and should have ranges added to them if available.

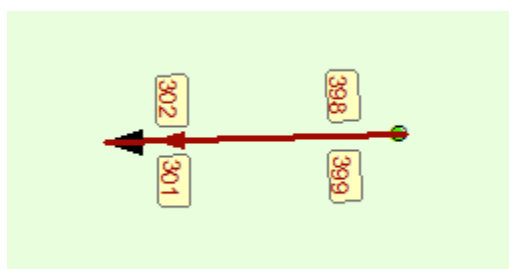
Impact: Address ranges of 0 to 0 cannot be used in the geocoding process, though they may be valid in many cases (such as one side of a road running along a cliff such that no house can be addressed on the cliff side of the road).



RCL Low vs. High range Conflict — Code 507

The high address range left and right should be a greater number than the low address range left and right. Ranges that have the greater number in the low range will lead to geocoding errors since the interpolation will work in reverse, the addresses will appear to decrease in the direction of the line instead of increasing.

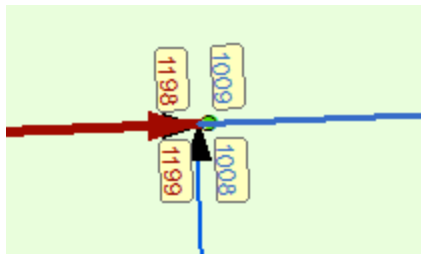
Impact: Ranges that have the greater number in the low range will lead to geocoding errors since the interpolation will work in reverse, the addresses will appear to decrease in the direction of the line instead of increasing.



RCL Parity Inconsistency — Code 508

Most addressing systems assign continuous even addresses to one side of a thoroughfare and continuous odd addresses to the other. An even number address range for one RCL on the odd side of other RCLs may indicate an error condition. Addressing schemes that do not use parity are often found in communities that use lot numbering for their addressing.

Impact: Not identifying the parity could cause a point in polygon placement error routing to the incorrect PSAP.



RCL to Polygon Attribute Mismatch — Code 513

RCLs often contain attributes that relate information that originates from the polygon feature class. When the RCL attributes that are related to the Polygon layer do not agree with the attribution of the Polygons an error condition exists.

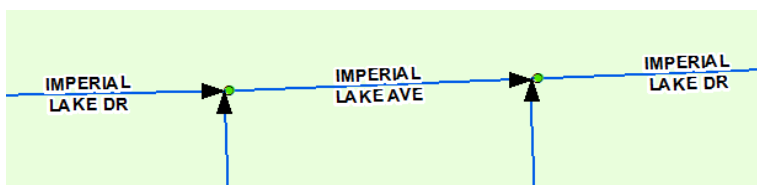
Impact: Not syncing up the attribute data between the RCLs and polygons can cause a conflict of which attribute is correct, the road centerline or the polygon attribute.



RCL to RCL Attribute Mismatch — Code 514

RCLs that represent adjacent, contiguous features are checked for consistent attribution. Related RCLs with mismatching attributes may indicate an error condition.

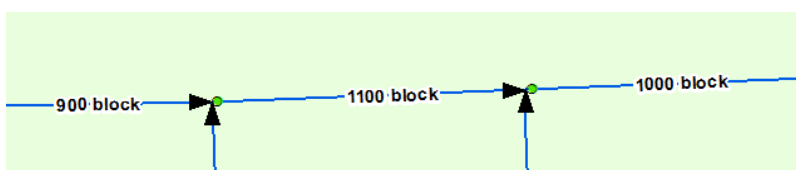
Impact: If an RCL segment is in error and left uncorrected an incorrect attribute could impact the automated call routing process.



RCL Address Range Out Of Sequence — Code 516

RCLs that represent adjacent, contiguous features are checked for consistent address ranging. The error segment has an address range that numerically is not consistent between its contiguous neighbors.

Impact: If an RCL is incorrectly addressed, and the situation not corrected, incorrect location identification can occur, such as with a point-in-polygon determination for automated call routing.



Required Field Values Missing — Code 599

A minimum set of attributes needed to accomplish the purpose of the RCL feature class as defined. Any feature that does not have complete attribution is found in error. Note that not all required attributes will have values, but others must always contain a value. For example, a directional field may not have a value if none is needed but all RCLs should have a name field value.

Impact: If critical location information values are missing, such as street name, calls may not geocode properly, or at all.

RCL Attribute Has No USPS Standard Abbreviation Match — Code 517

Identifies a 'Prefix Direction', 'Post Type', or 'Post Direction' abbreviation as not being USPS publication 28 compliant (see Appendix B – References on Postal Standards).

Impact – Non-standard abbreviations can cause problems in NG9-1-1 systems where their values are not recognized. (ex. LVF/ECRF).

RCL Has Duplicate Address Attributes — Code 518

Duplicate attribution for two or more APs are present in the same feature class (nulls and zeros are excluded).

Impact – Duplicate RCLs should not be present in NG9-1-1 functional elements such as the LVF or ECRF.

Polygon Geometry Analysis

Polygons with Empty (Null) Geometry — Code 600

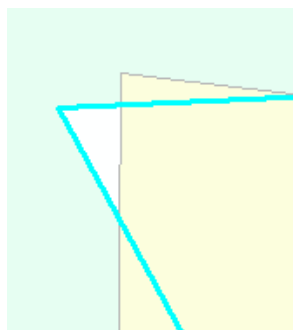
Null geometry can be created unintentionally by users or software. Null geometry essentially means a tabular record is represented in your map database without a graphic representation.

Impact: Records that lack geometry cannot be shown on a map or used for geocoding.

Polygons with Geometry Overlaps — Code 601

ESZ, Community, and most other polygons used in 9-1-1 are geographically exclusive; no space can have more than one value. Overlaps are sources of error and should be eliminated.

Impact: Having more than one polygon cover any geomorphic space will adversely impact point in polygon analysis and subsequent call routing.



Polygons with Geometry Gaps — Code 602

Polygons that have gaps between each other should in a single layer should not be present, unless they represent more than one non-contiguous jurisdiction polygon.

Impact: Unintentional gaps between polygons can lead to the inability of an LVF or ECRF to operate properly when a spatial query falls within a polygon gap.

Polygons with No Coincident Vertices — Code 603

Identifies vertices between adjacent polygons that do not match or are missing between the two.

Impact: Allows the User to develop a tighter association between coincident polygon boundary lines such that a transformation (as when data is reprojected) of two polygons adjacent to each other will generate as few new boundary line gaps/overlaps as possible when this process occurs (ex. changing from State Plane to WGS84).

Required Field Values Missing — Code 699

A minimum set of attributes needed to accomplish the purpose of the polygon feature class is defined. Any feature that does not have complete attribution will be found in error.

Impact: If critical location information values are missing, such as responder information in an ESZ layer, assigning the correct responder to a location may not work. Will not be able to auto populate created features.