

**Digital Data**  
Technologies Inc

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# Montana NG9-1-1 Analysis Statistics

# Introduction

## Purpose

In 2009, the National Emergency Number Association (NENA) established and published a transitional plan for reviewing and using GIS data in Next Generation 9-1-1 (NG9-1-1). The expected audience are local agencies who maintain or participate in the GIS operations of the entity.

The goal of the published information is to bring awareness of possible negative impacts from out of sync data to the new system. Outlined in **NENA 71-501**<sup>1</sup> are guided examples to synchronizing the Master Street Address Guide (MSAG) and the Automatic Location Information (ALI) databases to Geographic Information System (GIS) road centerline and site / structure address points. This synchronization process will improve the accuracy of the GIS data, the MSAG and ALI databases, aid in preparing PSAPs for NG9-1-1 and improve the accuracy of the GIS data currently used by PSAPs for mapping calls.

DDTi Quality Control (QC) measures as outlined in this document and performed on your data adhere and go beyond the NENA document. The QCs can ensure there will be no loss of 9-1-1 service to the public after transition is complete to NG9-1-1 and improve E9-1-1 call routing.

It is important to note that experience levels and capacity play large parts in the QC plan. A clear maintenance plan is strongly recommended for optimal remediation.

## Scope

It is within the scope of this work to analyze and report layer consistency and synchronization between the MSAG, ALI, and GIS. Quality control results rely heavily on layer availability. Some checks may not be possible with incomplete data.

Delivery includes this PDF document report and accompanying QC results along with the original data received from each PSAP.

**Here is a statistical summary of the entire state of Montana. For complete results from each PSAP see the Excel Spreadsheet Statistics.xlsx**

## Getting Started

For the best analysis the following are requirements for DDTI's analysis.

### Road Centerlines at a minimum must have fields for...

- Street Name Components parsed into
  - Prefix Direction
  - Street Name
  - Street Type
  - Suffix Direction
- Address Range Components
  - Left From
  - Left To
  - Right From
  - Right To
- MSAG Community
  - Left Community
  - Right Community

### Address Points at a minimum must have fields for...

- House Number
  - Numeric values only
- Street Name Components parsed into
  - Prefix Direction
  - Street Name
  - Street Type
  - Suffix Direction
- MSAG Community

### Emergency Service Zones at a minimum must have fields for...

- Emergency Service Number

*The data may be edited to meet parsing requirements and noted in the report.*

## Source Layers

### County/PSAP GIS Data

Files utilized:

Road Centerlines (56)

Address Points (56)

ESZ Boundary (52)

Law Boundary (16)

Fire Boundary (17)

EMS Boundary (14)

PSAP Boundary (9)

Data Projection Delivered in: NAD 1983 StatePlane Montana FIPS 2500 (Meters).

### Service Provider Data

MSAG (56)

ALI (56)

### State of Montana GIS

Files utilized from State of Montana

- MontanaIncorporatedCitiesTowns
- TransportationFramework

## Synchronization Results

It is recommended that a minimum match rate of **98%** be set prior to using the GIS data in the Emergency Routing Data Base (ERDB) or the Location to Service Translation (LoST) Protocol services.

### Summary

Synchronization Test	Average	Count of PSAPs with 0% Match	Count of PSAPs with less than 98% Match	Count of PSAPs with greater than 98% Match
ALI to MSAG	99.92%	0	0	50
MSAG to Roads (Name)	63.58%	10	47	3
MSAG to Roads (Range)	50.04%	10	49	1
Addresses to MSAG	67.01%	8	43	7
ALI to Road Centerlines	63.66%	10	49	1
ALI to Addresses	61.95%	8	46	4

0% Match relates to GIS data missing community information.

98% Match (or better) is the end goal.

## MSAG Internal Checks

QC Description	Tested Y/N	Average	Total Count	Count of PSAPs with errors
Duplicate record	Y	3.06	153	1
House number range is invalid	Y	1.1	55	10
Zero mix in range	Y	35.1	1755	14
Range low greater than high	Y	0	0	0
Range overlap	Y	3.72	186	6
Parity Invalid	Y	1.04	52	2
Parity does not match range	Y	0	0	0
Low high difference > 10,000	Y	8.59	421	22
Range not numeric	Y	0.00	0	0

## Emergency Service Boundary

GAPS	ESZ	EMS	Fire	Law
Average (Statewide)	34.10	42.54	7.56	0.29
Total	1637	553	121	4
Count of PSAPs with errors	23	3	7	3
Average (from PSAPs with errors)	71.17	184.33	17.29	1.33

OVERLAPS	ESZ	EMS	Fire	Law
Average (Statewide)	34.79	37.62	5.44	0.21
Total	1670	489	87	3
Count of PSAPs with errors	23	2	6	2
Average (from PSAPs with errors)	72.61	244.50	14.50	1.50

Montana NG9-1-1 Analysis Statistics – March 2019

<b>ROAD CROSSES WITH NO BREAK</b>	<b>ESZ</b>	<b>EMS</b>	<b>Fire</b>	<b>Law</b>	<b>Muni</b>
Average (Statewide)	115.75	44.92	73.63	68.57	3.98
Total	5556	584	1178	960	199
Count of PSAPs with errors	38	9	13	9	21
Average (from PSAPs with errors)	146.21	64.89	90.62	106.67	9.48

## Road Centerlines

Road Centerline Checks	Average (Statewide)	Total	Count of PSAPs with errors	Average (from PSAPs with errors)	File
NENA prefix	12.38	619	6	103.17	Roads_Internal_QC_Lines
NENA type	240.34	12017	32	375.53	Roads_Internal_QC_Lines
NENA suffix	6.96	348	7	49.71	Roads_Internal_QC_Lines
Intersection not snapped	465.8	23290	44	529.32	Roads_Internal_QC_Points
Road cross with no intersection	52.56	2628	37	71.03	Roads_Internal_QC_Points
Address range flows against directional arrows	75.14	3757	42	89.45	Roads_Internal_QC_Lines
Overlap in address range	657.22	32861	50	657.22	Roads_Internal_QC_Lines
Gap in address range & direction errors	875.82	43791	50	875.82	Roads_Internal_QC_Lines
Duplicate road geometry	28.56	1428	33	43.27	Roads_Internal_QC_Lines
Geometry is a MultiLineString	4.02	201	19	10.58	Roads_Internal_QC_Lines
Sharp Angle in line	30.42	1521	47	32.36	Roads_Internal_QC_Lines
Segment is too short	56.7	2835	45	63.00	Roads_Internal_QC_Lines
Coincident with PSAP boundary	4960.9	49609	10	4960.90	Manual Calculation
Not Covered by PSAP boundary	2438.4	24384	5	4876.80	Manual Calculation
Parity compare between address point and associated road segment - Possible flip	381	19050	41	464.63	Addresses_External_Roads_QC
No matching roads segment to address point within specified distance (120m)	3958.62	197931	49	4039.41	Addresses_External_Roads_QC
Flow of Addresses range	195.24	9762	39	250.31	Addresses_External_Roads_QC
Invalid road geometry	0.18367347	9	7	1.29	Manual Calculation
Null Geometry	0.52083333	25	3	8.33	Manual Calculation



## Address Points

Address Point Checks	Average (Statewide)	Total	Count of PSAPs with errors	Average (from PSAPs with errors)	File
NENA prefix	5.98	299	11	27.18	Addresses_Internal_QC
NENA type	124.74	6237	32	194.91	Addresses_Internal_QC
NENA suffix	27.52	1376	12	114.67	Addresses_Internal_QC
Street name blank	35.36	1768	16	110.50	Addresses_Internal_QC
Address geometry duplicate of another	9225.2	461260	46	10027.39	Addresses_Internal_QC
Address attributes duplicate of another	899.46	44973	50	899.46	Addresses_Internal_QC
Address attributes duplicate of another (different locations)	677.98	33899	48	706.23	Addresses_Internal_QC
House Number not contained by closest segment address range	572.86	28643	41	698.61	Addresses_External_Roads_QC
Address with no matching street name	3365.82	168291	48	3506.06	ADDRESS_POINTS_WITH_NO_MATCHING_STREET_NAME_
Parity compare between address and associated road segment - Possible flip	409.74	20487	41	499.68	Addresses_External_Roads_QC
No matching roads segment to address within specified distance (120m)	4292.28	214614	50	4292.28	Addresses_External_Roads_QC
Flow of Addresses range	194.9	9745	38	256.45	Addresses_External_Roads_QC

\*\*Address geometry duplicate of another is from multiple address points on top of each other and reports how many duplicates for each address point. So, 100 address points with the same geometry would report 9,900 results.

## External Checks

ALI to MSAG	No Match Name	No Range Match
Average (Statewide)	10.76	14.06
Total	538	703
Count of PSAPs with errors	8	10
Average (from PSAPs with errors)	67.25	70.30

MSAG to Roads	No Match Name	No Range Match	Partial Range Match	Matching Name and Range but no ESN Match
Average (Statewide)	342.56	131.76	237.48	258.84
Total	17128	6588	11874	12942
Count of PSAPs with errors	50	42	40	36
Average (from PSAPs with errors)	342.56	156.86	296.85	359.50

Addresses to MSAG	No Match Name	No Range Match	Multi Range Match
Average (Statewide)	2712.40	2670.74	159.88
Total	135620	133537	7994
Count of PSAPs with errors	50	49	42
Average (from PSAPs with errors)	2712.40	2725.24	190.33

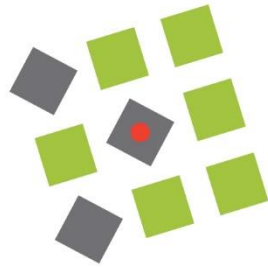
ALI to Roads	No Match Name	No Range Match	Multi Range Match
Average (Statewide)	1373.18	327.74	109.24
Total	68659	16387	5462
Count of PSAPs with errors	50	44	38
Average (from PSAPs with errors)	1373.18	372.43	143.74

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<b>ALI to Addresses</b>	<b>ALI with no Address Match (to a primary name)</b>	<b>ALI with no Address Match and Multiple Ranges</b>	<b>No matching Name</b>	<b>No match range</b>	<b>Address only Match</b>
Average (Statewide)	1439.48	26.46	657.54	60.56	1439.48
Total	71974	1323	32877	3028	71974
Count of PSAPs with errors	39	23	50	36	39
Average (from PSAPs with errors)	1845.49	57.52	657.54	84.11	1845.49

<b>ALI to ESZ</b>	<b>Contained in wrong polygon (without address point)</b>	<b>Contained in wrong polygon (with address point)</b>
Average (Statewide)	275.80	1567.52
Total	13790	78376
Count of PSAPs with errors	31	37
Average (from PSAPs with errors)	444.84	2118.27

For complete results from each PSAP see the Excel Spreadsheet Statistics.xlsx



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# Montana NG9-1-1 Cross Jurisdiction Overlaps

A Cross-Jurisdiction roads comparison with overlapping geometry was conducted in order to compare the address ranges and arrow directions. Overlapping geometry with differing county fields was

compared and successfully found when county A data crosses into County B and then compared the arrow direction and address ranges between the overlapping segments. However, this did not find results if County A data crosses into County B AND distinguishes the county changes in the county field. For example: Anaconda-Deer Lodge roads covered most of Granite County but made the necessary data change to distinguish that the data is in Granite County and not in Deer Lodge. The overlapping Granite County and Deer Lodge data would not report back an overlap.

All overlapping geometry was not reported because the results would include data within the same datasets, such as roads overlapping in just 1 county.

The results show the uniqueids (ID1 and ID2) related to the overlapping geometry and notify if the Address Ranges overlap (1=overlap) and Directions Differ (1=Differing direction) and includes the OverlapLength (in meters).

The results are 8421 segments where road geometry overlaps with 2394 segments with a range overlap, 2715 segments where arrow direction differs, and 3623 segments where road segments overlap but arrow flow is the same and ranges do not overlap. *If 1 of the overlapping segments has an Address range of 0 to 0, then it would not count as having an overlapping address range.*

Overlapping geometry results are found in the Overlap\_Results shapefile with a merged statewide road layer called Montana\_NextGenDataModelRoads shapefile for reference.