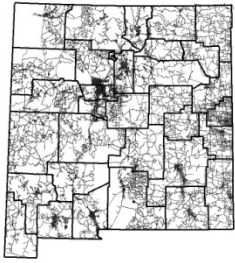


# 9-1-1 Database Measurement Tools

Presented by Susan Cunningham and James Stewart  
Spatial Data Research, Inc.  
October 26<sup>th</sup>, 2009

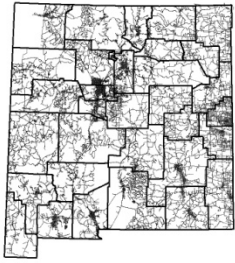


## 9-1-1 Database Measurement Tools



There is and will continue to be a lot of focus on improving databases related to 9-1-1 service and call mapping.

There are 2 primary reasons for this focus... and no, they have nothing to do with confusing, annoying or making anyone look bad. (Those are just side benefits!)

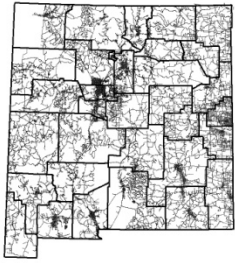


## 9-1-1 Database Measurement Tools



Reason #1 for measuring and improving 9-1-1 database accuracy:

It can save time, lives and property during emergency situations.

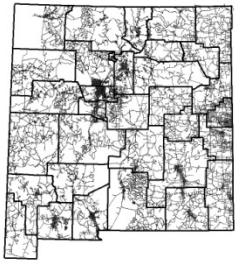


## 9-1-1 Database Measurement Tools



Reason #2 for measuring and improving 9-1-1 database accuracy:

Next Generation 9-1-1 relies even more heavily on accurate, standardized and complete GIS databases because they are used for more in that environment.

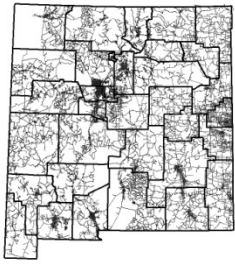


## 9-1-1 Database Measurement Tools



Also, the GIS data currently used only to map 9-1-1 calls will “become” the MSAG in that environment.

So, before the MSAG goes away, it’s important to get everything you need from it into the GIS data. And why not start today? After all, remember it will help things now as well!

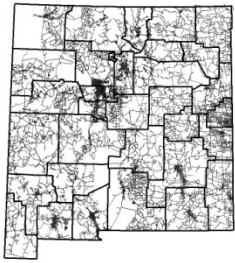


## 9-1-1 Database Measurement Tools



In this session, we'll talk briefly about available measurement tools and results – some of which you already have or receive and some of which you soon will!

There will be more on some of these tools in other sessions but let's have a brief look at each for now.



## 9-1-1 Database Measurement Tools

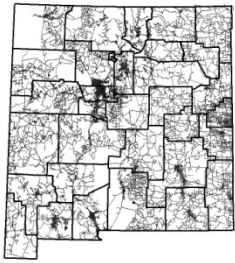


### *Upload Acceptance Report (UAR) –*

The main quality control report created for each road centerline GIS layer submitted to the [NM 9-1-1 GIS Database](#).

#### Purposes:

- Confirms that the submitted data was received
- Lists all observed issues with the GIS data and/or addressing



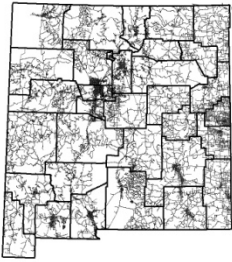
## 9-1-1 Database Measurement Tools



*Upload Acceptance Report (UAR) –*

SDR sends these to the submitting Data Source via e-mail after completing quality control review of the data. SDR also sends these reports to the PSAP and DFA.

Generally speaking, the longer the report, the more errors there are (but this is also related to how large the datasets are as well).



# 9-1-1 Database Measurement Tools



## *Upload Acceptance Report (UAR) –*

**Upload Acceptance Report CO CO 20090924.doc** **Page 1 of 5**

Road centerline shapefile reviewed: COL2\_Road.shp  
Date that shapefile was uploaded: 20090914  
Date that shapefile was last modified: 20090903  
Total file size of shapefile .SHP, .DBF and .SHX: 1.57 MB  
Number of attribute records: 1732  
Coordinate system, datum and units of shapefile: State Plane NM East, NAD 83, feet  
QA/QC date: 20090924  
QA/QC status: Accepted  
QA/QC performed by Shay Brown, Spatial Data Research, Inc.

### Quality Assurance/Quality Control Notes

Problems or potential problems found with changes to feature geometry or attribution since the last accepted submission. (Please note that items listed here in previous versions of this report have been moved to the most appropriate section or sections):

- Changes detected, but no errors found.

Inconsistent/overly-similar road names with same ZIP code community name:

- No problems found

Non-standard address ranges:

- 0 feature(s) has/have address ranges that end with 0 but don't start with 0
- 0 feature(s) has/have address ranges that start with 0 but don't end with 0
- 7 feature(s) has/have non-0 address ranges associated with blank road name values
- 0 feature(s) has/have negative address range values

Automated examination of address range logic:

- See Address\_Range\_Logic\_Colfax\_20090925.xls for specific feedback on problems with road names and address ranges that may affect 9-1-1 call mapping at the PSAP. NOTE: this examination was performed on the output road centerline data returned to the Raton Police Department PSAP in September 2009, which includes data from other sources - look for rows or groups of rows with the Colfax County DSID (CO\_CO).

Road centerline data with all-zero address ranging (will hinder the ability to map 9-1-1 calls):

- None

Problems found with presence of required attribution fields or with their format, name or length:

- No problems found

UAR V. 20090427

**Upload Acceptance Report CO CO 20090924.doc** **Page 2 of 5**

Unabbreviated prefix directional values in the prefix directional field:

- None

Prefix directional values (abbreviated or unabbreviated) in the main road name field:

- The only example of this has been moved to the Approved Exceptions section of this document.

Unnecessary or redundant prefix directional values:

- None

Highways, county roads and other numbered road names that are not compliant with postal standards (see USPS Publication 28):

- HWY 120, HWY 127, etc. - These were changed from HIGHWAY... to better synchronize with the MSAG but this naming convention does not conform with postal standards in that (a) HWY is abbreviated and (b) there is no state, federal or other designation such as NM HIGHWAY ...
- US HWY 56 and US HWY 64 - See above. Before the recent change, these records were compliant with postal standards.

Suffix type values that don't match USPS standard abbreviations:

- None

Suffix type abbreviations in the main road name field (should be spelled out or placed in the suffix type field, as appropriate):

- None

Unabbreviated suffix type values in the main road name field that should be abbreviated and moved to the suffix type field:

- The only examples of this have been moved to the Approved Exceptions section of this document.

Unnecessary/redundant suffix type values (generally where the road name includes a type value already yet one is appended):

- None

Suffix directional values (abbreviated or unabbreviated) in the main road name field:

- None

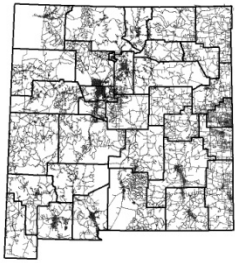
Unabbreviated suffix directional values in the suffix directional field:

- None

Features with both a prefix and a suffix directional value:

- None

UAR V. 20090427



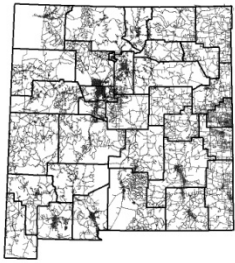
## 9-1-1 Database Measurement Tools



*Upload Acceptance Report (UAR) –*

What it tells you about your data:

1. Whether or not the data was accepted
2. Problems introduced since the last upload
3. Road names not compliant with USPS standards



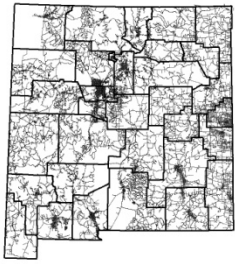
## 9-1-1 Database Measurement Tools



*Upload Acceptance Report (UAR) –*

What it tells you about your data:

4. Road name parsing/concatenation problems
5. Roads without name and range data
6. Problems with attribution format itself



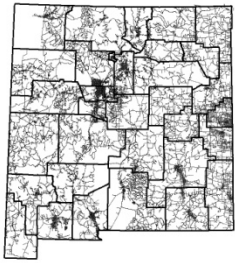
## 9-1-1 Database Measurement Tools



*Upload Acceptance Report (UAR) –*

What it tells you about your data:

7. Road name typos, misspellings and illegal characters
8. Some address range problems not in the Address Range Logic Test results (more on that later)



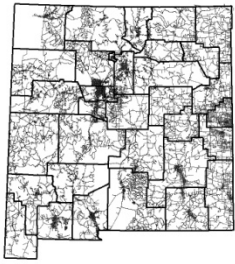
## 9-1-1 Database Measurement Tools



*Upload Acceptance Report (UAR) –*

What it tells you about your data:

9. Some topological issues (snapping and segmenting) not shown in the topology review results (more on that later)
10. Roads with multi-part or null geometry



## 9-1-1 Database Measurement Tools

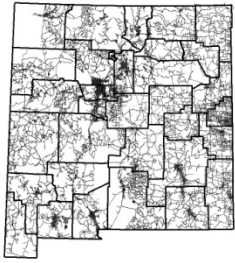


*Upload Acceptance Report (UAR) –*

What it tells you about your data:

11. Whether you have named an adequate number of roads in my honor (minimum 3)

12. Whether NM and US Highway paths match data from the NM State Highway and Transportation Department



## 9-1-1 Database Measurement Tools

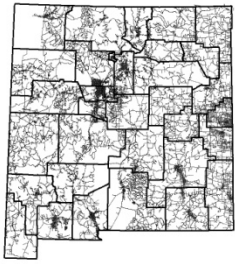


*Upload Acceptance Report (UAR) –*

What it tells you about your data:

13. How well updated your data is compared with recent aerial photography

14. Whether community name assignments match USPS ZIP code community names



## 9-1-1 Database Measurement Tools

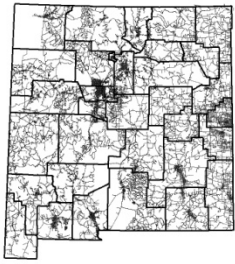


*Upload Acceptance Report (UAR) –*

What it tells you about your data:

15. How logical your addressing system(s) is/are

Also, there is a section of the report where SDR places items that Data Sources have submitted as exceptions to the process standards.



## 9-1-1 Database Measurement Tools

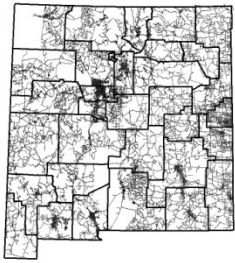


*Upload Acceptance Report (UAR) –*

The UAR also references several other routine and custom reports.

The custom reports are usually created when the same problem shows up in a dataset too many times to include in a quick bulleted list in the UAR.

Now, the routine reports that accompany the UAR...



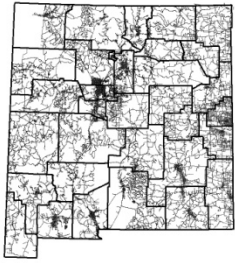
## 9-1-1 Database Measurement Tools



### *Address Range Logic Test (ARLT) results –*

This report is a spreadsheet that is intended to call out problems with address ranges not just in data from a single Data Source but in all road GIS data being used at a PSAP.

Some problems can be resolved by one Data Source and others will require cooperation between Data Sources. (Edge matching will also fix a few of these issues.)



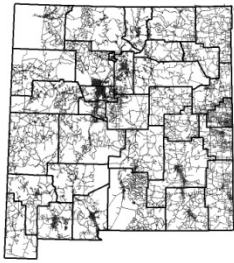
## 9-1-1 Database Measurement Tools



### *Address Range Logic Test (ARLT) results –*

This test is performed entirely in a spreadsheet so there is no “spatial element” to it.

It also relies on sorting the data by road name so basic problems with road name attribution can make the results less complete.



# 9-1-1 Database Measurement Tools

## Address Range Logic Test (ARLT) results –

### NEW MEXICO 9-1-1 GIS DATABASE

#### RESULTS OF DETAILED ROAD NAME AND ADDRESS RANGE ANALYSIS TAB 2 -- LEFT RANGE ANALYSIS

##### INSTRUCTIONS:

The records below exhibit one or both of the following problems with their left-side address ranges:

- (1) **OVERLAPPING RANGES** – Check Column E to see if the record has a left-side address range that overlaps the left-side address ranges of any other records with the same complete road name and left-side MSAG community value. Overlapping ranges present a problem to geocoding of addresses during 9-1-1 calls because certain numbers may appear along more than 1 segment.
- (2) **PARITY MISMATCHES** – Check Column F to see if the record has inconsistent parity in its left-side address range. If one value is even and the other value is odd on the left side, PROBLEM will appear in this column. If both values are 0, nothing will be flagged, but if one value is 0 and the other is not, PROBLEM will appear in this column.
- (3) **PARITY SWITCHES** – Check Column G to see if this record has different left-side parity from either of the adjacent records (above or below) with the same complete road name and left-side MSAG community value. For instance, if one record of MAIN ST in Springfield has an odd left-side address range (1-99) and the following record with the same road and community names has an even left-side address range (100-198), PROBLEM will appear in this column for both records.

L_ADD LOW	L_ADD HIGH	COMPLETE ROAD NAME & LEFT COMMUNITY	LEFT RANGE OVERLAPS WITH...	LEFT SIDE PARITY MISMATCH	LEFT SIDE PARITY SWITCH
8601	9399	ACHENBACH CANYON RD - LAS ALTURAS	DA_CO BELOW		
8601	9399	ACHENBACH CANYON RD - LAS ALTURAS	DA_CO ABOVE		
2801	2899	AIRPORT RD - SANTA TERESA	DA_CO		PROBLEM
2900	2999	AIRPORT RD - SANTA TERESA	DA_CO	PROBLEM	PROBLEM
1701	1711	ALAMO ST - LAS CRUCES	DA_CO BELOW		
1711	1785	ALAMO ST - LAS CRUCES	DA_CO ABOVE		
4401	5099	ALVAREZ RD - LA UNION	DA_CO		PROBLEM
5100	5399	ALVAREZ RD - LA UNION	DA_CO	PROBLEM	PROBLEM
7739	7751	AMBER DR - ORGAN	DA_CO BELOW		
7741	7803	AMBER DR - ORGAN	DA_CO ABOVE		

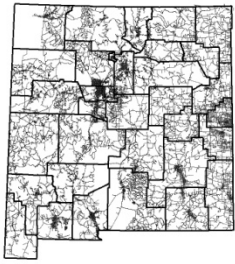
### NEW MEXICO 9-1-1 GIS DATABASE

#### RESULTS OF DETAILED ROAD NAME AND ADDRESS RANGE ANALYSIS TAB 4 -- UNEQUAL AND REVERSED ADDRESS RANGES

##### INSTRUCTIONS:

- (1) Check Column I for flagged problems with unequal ranges. A value of PROBLEM for a record indicates that the number of possible left and right addresses are off by more than 1. A value of MIXED PARITY means that this test cannot be reliably completed because the address range does not have consistent odd/even parity – these are reported more fully in TAB 4. **NOTE:** There are 2 legitimate exceptions to the rule that the left and right side must have the same number of available addresses and both of them will be recognized by the formulas in this spreadsheet. (A) Address ranges that start at 1 should have 1 more available address on the odd side than on the even side because ranges cannot start at 0 – these are accounted for in Columns G and H so that the side that starts with 2 will have one more address calculated in. (B) Segments with addressing on one side only and 0 values in both fields on the other side.
- (2) Check Column J for records that have reversed address ranges – these have higher LOW values than HIGH values on one or both sides of the road. This is sometimes due to the range having entered incorrectly in the GIS or, sometimes, results from the entire road segment being reversed in directions. Example: a range of 999-901 is invalid because it is reversed. It should be 901-999 and it can be fixed by either changing the range values or "flipping" the entire segment, whichever is the correct solution.

L_ADD LOW	L_ADD HIGH	R_ADD LOW	R_ADD HIGH	COMPLETE ROAD NAME	DSID	# OF LEFT- SIDE ADDS	# OF RIGHT- SIDE ADDS	UNEQUAL RANGES	REVERSED RANGES
811	1051	920	940	ABBAY RD	DA_CO	121		11 PROBLEM	
5731	5737	5720	5800	ABERDEEN ANGUS WAY	DA_CO	4		41 PROBLEM	
2401	2449	2400	2440	ACOMA ST	DA_CO	25		21 PROBLEM	
511	571	510	560	ADAMS ST	DA_CO	31		26 PROBLEM	
801	825	800	820	ADAMS ST	DA_CO	13		11 PROBLEM	
901	925	908	926	ADAMS ST	DA_CO	13		10 PROBLEM	
5883	5999	5882	5898	AGAVE LN	DA_CO	59		9 PROBLEM	
4805	4829	4802	4830	AGAVE PL	DA_CO	13		15 PROBLEM	
2317	2357	2306	2356	AGUIRRE CT	DA_CO	21		26 PROBLEM	
5075	5143	5000	5098	ALAMO MINE TRL	DA_CO	35		50 PROBLEM	
5145	5199	5100	5198	ALAMO MINE TRL	DA_CO	28		50 PROBLEM	
1711	1795	1714	1794	ALAMO ST	DA_CO	43		41 PROBLEM	
101	111	100	200	ALARGO DR	DA_CO	6		51 PROBLEM	
205	281	210	270	ALBIDRES ST	DA_CO	39		31 PROBLEM	
303	395	310	396	ALBIDRES ST	DA_CO	47		44 PROBLEM	



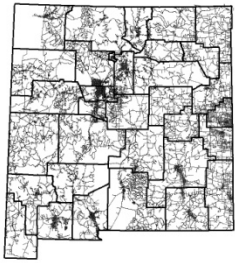
## 9-1-1 Database Measurement Tools



*Address Range Logic Test (ARLT) results –*

What they tell you about your data:

1. Where there are problems with overlapping address ranges (road name and community must be the same, examines each side separately)
2. Where there are road features that don't have odd values on one side and even on the other



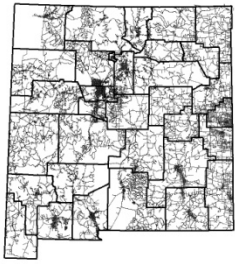
## 9-1-1 Database Measurement Tools



*Address Range Logic Test (ARLT) results –*

What they tell you about your data:

3. Where odds and evens switch sides while the road name and community stay the same
4. Where road features have a longer range on one side than on the other



## 9-1-1 Database Measurement Tools

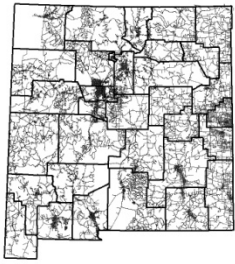


*Address Range Logic Test (ARLT) results –*

What they tell you about your data:

5. Where road features have a higher “low” address range value than the “high” value

Also, each feature flagged with an issue in the report has information telling you which Data Source submitted it.



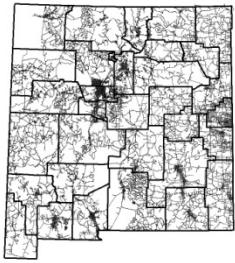
## 9-1-1 Database Measurement Tools



*“Topo” shapefiles –*

SDR uses automation to generate shapefiles (GIS layers) that illustrate the locations of topological issues such as snapping, segmenting and feature overlap.

If there are a reasonable number of results, SDR verifies each and creates a problem description for each in the shapefile attribution.



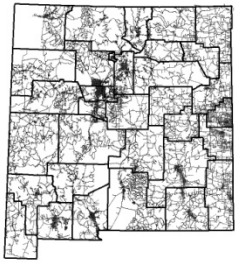
## 9-1-1 Database Measurement Tools



*“Topo” shapefiles –*

You will need to have GIS software to see and use these results but, if you're interested in looking at a simple list, you can open the .dbf in Excel to see how many there are.

Also, it is possible to make one mistake and have it show up more than once in the results.

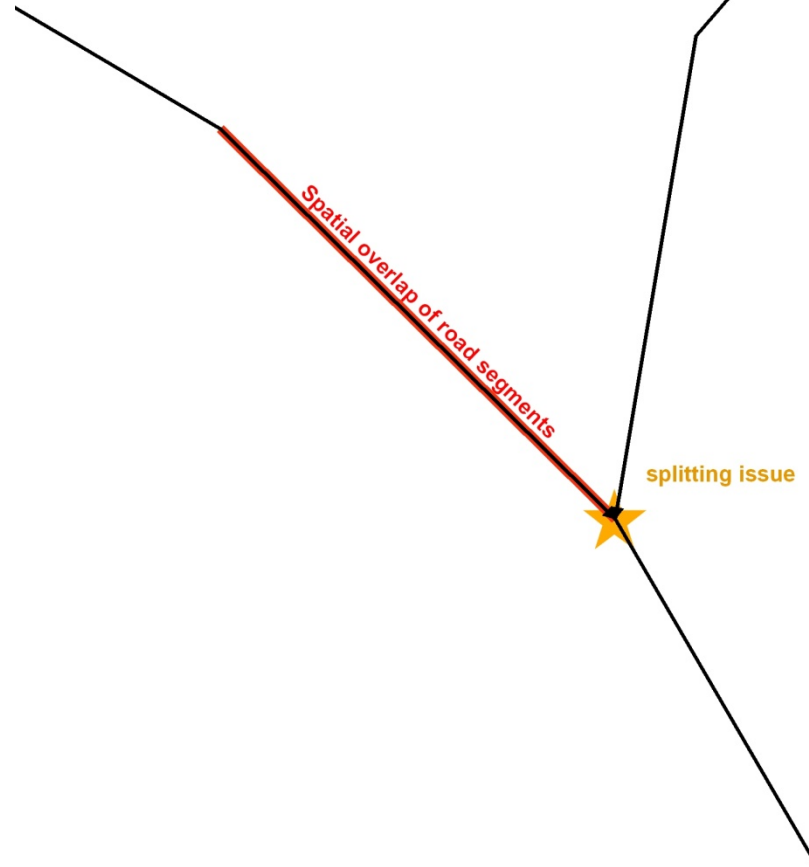


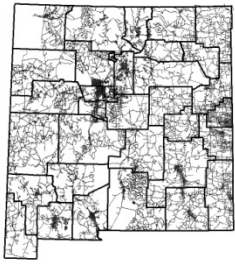
## 9-1-1 Database Measurement Tools



*“Topo” shapefiles –*

The red (line) result  
and the orange  
(point) results are  
related in this case.



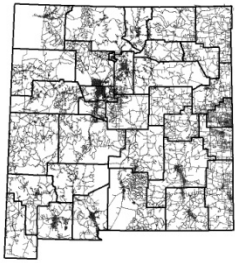


## 9-1-1 Database Measurement Tools



*“Topo” shapefiles –*

Please note that these shapefile results will not find every topological issue with the data. For instance, it cannot tell whether two roads actually should connect like a human being can – it just knows that the ends of the roads are within a certain number of feet of each other and that, usually, that means that the roads should connect.



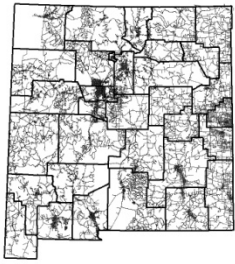
## 9-1-1 Database Measurement Tools



### *Road-to-MSAG Comparison Tool (RMCT) –*

This is a rather complicated tool used by SDR to assess the level of matching between the road centerline GIS data that falls within a PSAP's area and the MSAG(s) for that PSAP.

Like most of the other tools discussed earlier, you will receive the results of the comparison, not the comparison tool itself.



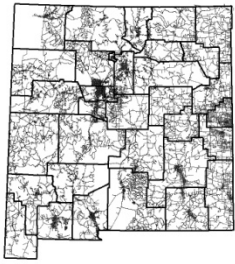
## 9-1-1 Database Measurement Tools



### *Road-to-MSAG Comparison Tool (RMCT) –*

It produces two sets of percentages that are fairly independent of each other:

- 1.The % of road features that have a “perfect match” in the MSAG
- 2.The % of MSAG features that have a “perfect match” in the road layer



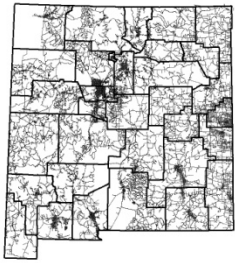
## 9-1-1 Database Measurement Tools



*Road-to-MSAG Comparison Tool (RMCT) –*

A “perfect match” means that the range of the feature being studied fits “within” the range of one or more features in the other database **that have the same complete road name and community name.**

When a feature fails to match perfectly, the automation attempts to find partial matches for road name and community.



# 9-1-1 Database Measurement Tools

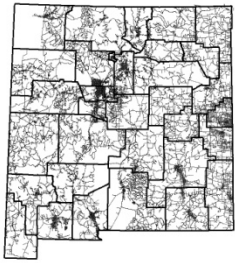


## *Road-to-MSAG Comparison Tool (RMCT) –*

Summary of results for one comparison:

MSAG records compared with RCL records	#	%	NOTES
Total MSAG records:	1188	n/a	
Percentage of Records Eligible for Comparison:	1157	97%	percentage of records matching RCL road name
<b>Records with perfect RCL matches:</b>	456	38%	name, community and range match the RCL
Records with RCL range mismatches only:	696	59%	name & community match the RCL but not the range
Records with name matches only in the RCL:	5	0%	only name matches the RCL (not community or range)
Records with no RCL matches:	31	3%	road name doesn't match the RCL (community and range were not checked)
Matches without checking community values:	518	44%	road name and range match RCL; community NOT checked

RCL records compared with MSAG records	#	%	NOTES
Total RCL records:	6396	n/a	
Percentage of Records Eligible for Comparison:	6078	95%	percentage of records matching MSAG road name
<b>Records with perfect MSAG matches:</b>	5955	93%	name, community and range match the MSAG
Records with MSAG range mismatches only:	83	1%	name & community match the MSAG but not the range
Records with name matches only in the MSAG:	40	1%	only name matches the MSAG (not community or range)
Records with no MSAG matches:	318	5%	road name doesn't match the MSAG (community and range were not checked)
Matches without checking community values:	5990	94%	road name and range match MSAG; community NOT checked



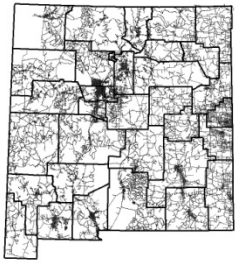
## 9-1-1 Database Measurement Tools



*Road-to-MSAG Comparison Tool (RMCT) –*

We'll save the detailed, record-by-record results for Session 1A tomorrow but, for now, the important part to convey to everyone here is that no one is at 100% matching today in both directions and that's where we need to be as soon as possible.

The results from this comparison will help you get there with minimal headache.

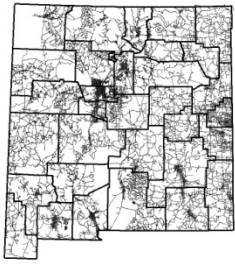


## 9-1-1 Database Measurement Tools



*MSAG Tool Kit –*

This is a tool that each of you should already have available to you and it is intended to help you maintain synchronization between your MSAG and your road centerline GIS data.



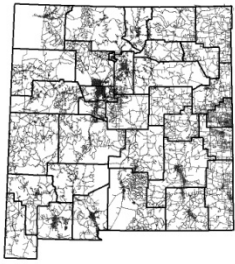
## 9-1-1 Database Measurement Tools



### *MSAG Tool Kit –*

There are 4 basic functions of the Tool Kit:

1. To assign MSAG-related attribution (ESNs and communities) to a road centerline GIS layer using boundary GIS layers
2. To create an MSAG from scratch that matches your road centerline GIS layer perfectly.



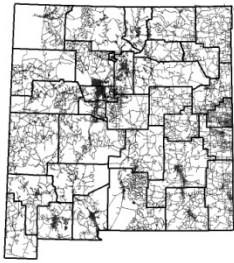
## 9-1-1 Database Measurement Tools



### *MSAG Tool Kit –*

There are 4 basic functions of the Tool Kit:

3. To compare the GIS-based MSAG to another MSAG already in a standardized format and provide recommendations on corrections
4. To convert the format of an MSAG to the required standard



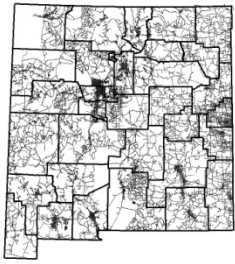
## 9-1-1 Database Measurement Tools



*MSAG Tool Kit* –

The Tool Kit is *not* intended to be used to measure database synchronization.

Also, while it provides recommendations on fixes, it makes all recommendations using the assumption that the GIS is 100% accurate and that the MSAG must be changed to match the GIS. In other words, it's for maintaining your data *after* you've synchronized it.



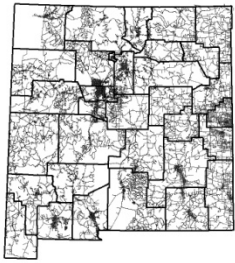
## 9-1-1 Database Measurement Tools



### *ALI Comparison Tools –*

There is no single, “official” tool for measuring ALI accuracy, largely because the data cannot be used for a comparison to GIS data without special arrangements with Qwest.

[The ALI (Automated Location Information) database contains the physical address associated with each landline phone number.]



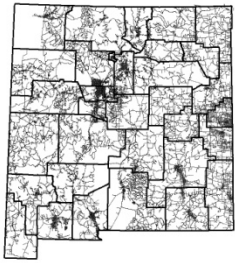
## 9-1-1 Database Measurement Tools



### *ALI Comparison Tools –*

The heart of an ALI comparison is to ensure that each address in the ALI database has a number that fits within the range of a road centerline GIS feature with the same complete road name and community name.

This much can be done without ever seeing whether or not the address actually would plot at the correct location.



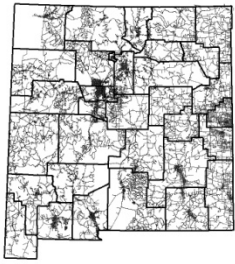
## 9-1-1 Database Measurement Tools



### *ALI Comparison Tools –*

The comparison can also be taken one step further by attempting to geocode an ALI database to the road centerline GIS data. This is done in much the same way as the PlantCML and Positron software does it at PSAPs during a real 9-1-1 call.

Some addresses will plot correctly, some will plot in the wrong place and some won't plot at all.



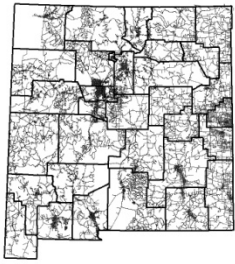
## 9-1-1 Database Measurement Tools



*Final notes –*

All of these tools are intended to make routine quality control of GIS data and 9-1-1 databases possible and/or efficient. However, none of these tools or reports will actually fix the data for you or keep it up-to-date automatically.

Also, sometimes there is no substitute for the human eye. SDR still performs much of its quality control “the old fashioned way”.



## 9-1-1 Database Measurement Tools



*Final notes –*

We will talk more about some of these reports and related follow up in subsequent sessions:

1. MSAG-to-road GIS comparisons (Session 1A)
2. Cleaning up “catch all” MSAG records (Session 2A)
3. Quality control reports you receive after uploading to the NM 9-1-1 GIS Database (Session 3A)