Michigan ENHANCE 911 Act GIS Grant Project
GIS Addressing Data Assessment Report

Organization: XXXXXX County, MI
Data Provided By: XXXXXX County 9-1-1
Data of Data Submission: 11/10/2011
Data Provided: Road Centerlines, Address Points, MSAG table, ESZ Boundaries.

1. Introduction

As part of the State of Michigan ENHANCE 911 Act GIS grant project, a basic GIS data validation of the road centerlines provided by XXXXXX County was performed. An integrated seamless statewide road centerline layer is a data layer requirement within the 9-1-1 GIS repository for the grant project. Road centerline gap fill and accuracy improvements are also the focus of the local sub-grant program. The overall assessment scores for the GIS road centerlines involve checks on spatial accuracy, topology and attributes.

In addition to the road centerline assessment score, this report provides information about the accuracy of road names and address ranges between the road centerlines and the MSAG. This information includes a fallout report of invalid records between MSAG and road centerlines to help the participants review these discrepancies. The National Emergency Number Association (NENA) outlines the importance of synchronizing GIS with MSAG and ALI in technical standards document 71-501 to improve overall data accuracy for locating 9-1-1 calls through all 9-1-1 datasets.

Where address structure points are available and provided for the assessment, the report outlines the number of addresses that are valid and not valid when geocoded against the road centerlines. A fallout report of addresses that do not geocode will provide participants with the information to review where inconsistencies might exist between the address structure points and the road centerlines.

2. Datasets

Data Analysis was performed using the following datasets from XXXXXX County:

- GIS Road Centerline file
- MSAG table
- Structures/Addresses/Points file

Other sources used for the data analysis:

- Michigan Geographic Framework (MGF) File
- State-wide Imagery (Best Available Mosaic Map Service) from Michigan Imagery Solution (MIS)

DRAFT SAMPLE

3. Data Checks / Scrubs

From these datasets, the following data checks/comparison tests were performed:

- Initial Standardization Checks: Flags missing required fields within provided datasets as well as range parities such as the low range is greater than the high range, and checks for range overlaps. Once records are flagged, valid fields are used to link within GIS data and MSAG database and check for invalid data.

- Centerline Files vs. MSAG Table: Scrub compares centerline road names against MSAG road names and centerline ranges against MSAG ranges.

- MSAG Table vs. Centerline Files: Scrub compares MSAG road names against centerline road names and MSAG ranges against centerline ranges

- Centerline Files vs. Michigan Geographic Framework (MGF) Files: Spatial comparison of the centerlines in the GIS centerline file against the statewide geographic framework data.

- Topology Check: This check looks for topology errors in the centerline file, including dangles, overlaps, and intersections that are not correctly split.

- Structure Point Geocoding: This check geocodes any address structure points, that are provided, against the GIS road centerlines provided to determine a list of any addresses that do not match address ranges.

4. Findings

4.1 Test Results

After performing the data checks / scrubs, the following results were reported. More specific details can be found in the fallout reports.

Centerline Review							
	Total Centerline Records						**1999**
1	**Spatial Accuracy Check**	**Poor**	**Fair**	**Good**		**Points**	**Score**
				X		**10**	**10**
2	**Line Direction Check**	**Poor**	**Fair**	**Good**			
				X		**5**	**5**
3	**Left and Right MSAG Community Fields**	**Absent**	**Incomplete**	**Complete**			
				X		**5**	**5**
4	**Left and Right ESN Fields**	**Absent**	**Incomplete**	**Complete**			
		X				**5**	**0**

DRAFT SAMPLE

Centerline Attribute Values Review					
5	Total Centerline Records				1999
6	Street Name Missing				16
7	MCD_L or MCD_R Values Missing				1
8	LLO Missing				0
9	LHI Missing				0
10	RLO Missing				0
11	RHI Missing				0
12	LO range is Greater Than HI range				23
13	Range Contains Zeros				68
14	Ranges on Both Sides are either Odd or Even				0
15	Centerline Records with Repeated Possible Addresses (Possible Overlapping Ranges)				145
16	Unrecognized Street Type Suffix				37
17	Number of Dangles Within 10 Foot Buffer of Another Road				157
18	Number of Road Segments That Cross Another Road Segment but not Intersected				78
19	Total Flagged Potential Error Records				525
20	GIS Centerline Percentage Accuracy				74%
	Total Centerline Assessment Score			Points	Score
21	Spatial Accuracy			10	10
22	Line Direction			5	5
23	Presence of Left and Right MSAG Community Name Fields			5	5
24	Presence of Left and Right ESN Fields			5	0
25	GIS Centerline Percentage Accuracy			75	55.5
26	Total Score			100	75.5
27	MSAG Community – Centerlines			Municipality	
28	MSAG Community - MSAG			Municipality	
29	Presence of Block Ranges (potential)	Yes	No		Count
	(potential ranges vs. actual ranges)	X			1752
CENTERLINE AND MSAG CHECKS					
			No Match	Match	%
30	Centerline street names that exist in the MSAG		267	1732	86.64%
31	MSAG street names that exist in the Centerlines		226	1175	83.87%
32	Centerline address ranges that exist in the MSAG		489	1510	75.54%

MSAG TABLE CHECKS				
33	**Total MSAG Records**			**1401**
34	**Street Name Check Field Value Errors**			**16**
35	**Range Field Check Value Errors**			**12**
36	**Records with Range Overlaps**			**11**
37	**Total Flagged Records**			**39**
Address Structure Points (If Provided)				
	Total Records			**16453**
		No Match	**Match**	**%**
38	**Matches on Centerlines**	**4831**	**11622**	**70.64**

4.2 Potential Projects

Potential Project Descriptions	
Fix topology issues and attribute errors	
Possible range issues – possible overlapping ranges, possible range issues in geocoding fallout,	
ESN fields Left and Right do not exist on road centerlines	

4.3 Results Explained

The following are explanations of the above totals:

1. This check looks at the spatial accuracy of the GIS road centerlines compared to a statewide orthophoto mosaic of best available imagery and also compared to the Michigan Geographic Framework road network. This checks involved a GIS analyst 'zooming' in to each municipality across the county to sample the accuracy of the road centerlines. The following results determine the scoring for this check:

   Poor – 50% to 100% of the samples show that the road centerlines are further than 10 feet away from the center of the roadways in those sample areas.

   Fair – 10% to 49% of the samples show that the road centerlines are further than 10 feet away from the center of the roadways in those sample areas.

   Good – 0 to 9% of the samples show that the road centerlines are further than 10 feet away from the center of the roadways in those sample areas.

DRAFT SAMPLE

2. This check looks at the line direction of the GIS road centerlines to determine if the road segments are digitized in the same direction as the increasing addresses along the road. This check involves a GIS analyst 'zooming' in to each municipality (this check is done at the same time as the spatial accuracy check) across the county to sample the line direction of the road centerlines. The following results determine the scoring for this check:

   Poor – 50% to 100% of the samples show that the road centerlines have been digitized in the opposite direction of increasing addresses along the road. The 'from' node is at the end of the road with highest addresses and the 'to' node is at the end of the road with the lowest addresses.

   Fair – 10% to 49% of the samples show that the road centerlines have been digitized in the opposite direction of increasing addresses along the road. The 'from' node is at the end of the road with highest addresses and the 'to' node is at the end of the road with the lowest addresses.

   Good– 0% to 9% of the samples show that the road centerlines have been digitized in the opposite direction of increasing addresses along the road. The 'from' node is at the end of the road with highest addresses and the 'to' node is at the end of the road with the lowest addresses.

   On the Centerline Fallout Report, the field FlippedRange will have a value of 1 for records where centerline segments were flipped using a script prior to the performing the data assessment checks. A script will be provided to project participants to run on their datasets to automatically flip arcs that are not going in the direction of addressing along a road and their associated attributes.

3. This check determines if the road centerline dataset has a field to track the Municipality Name along the left and Right side of the road and if the values within the fields have been populated.

   Absent – The Municipality Name fields do not exist within the GIS datasets.

   Incomplete – The Municipality Name fields along the left and right side of the road exist but some of the records do not have values within these fields.

   Complete– The Municipality Name fields along the left and right side of the road exist and have all of their records populated with values.

4. This check determines if the road centerline dataset has a field to track the Emergency Service Zone number along the left and right side of the road and if the values within the fields have been populated.

DRAFT SAMPLE

Absent – The Emergency Service Zone number fields do not exist within the GIS datasets.

Incomplete – The Emergency Service Zone number fields along the left and right side of the road exist but some of the records do not have values within these fields.

Complete– The Emergency Service Zone number fields along the left and right side of the road exist and have all of their records populated with values.

5. This is the total GIS road centerline records in the attribute table for that GIS layer.

6. This check looks for any records without a value in the street name field.

   On the Centerline Fallout Report, the field MissingSTN will have a value of 1 for records where the street name field has no value.

7. This check looks for any records without a value in either the left or right community name field.

   On the Centerline Fallout Report, the field MissingMCL will have a value of 1 for records where the left community name field has no value.

8. This check looks for any records with a blank value, null value, or alphanumeric value in the left-low address range field.

   On the Centerline Fallout Report, the field MissingLLO will have a value of 1 for records where the left-low address range field has an invalid value.

9. This check looks for any records with a blank value, null value, or alphanumeric value in the left-high address range field.

   On the Centerline Fallout Report, the field MissingLHI will have a value of 1 for records where the left-high address range field has an invalid value.

10. This check looks for any records with a blank value, null value, or alphanumeric value in the right-low address range field.

    On the Centerline Fallout Report, the field MissingRLO will have a value of 1 for records where the right-low address range field has an invalid value

11. This check looks for any records with a blank value, null value, or alphanumeric value in the right-high address range field.

    On the Centerline Fallout Report, the field MissingRHI will have a value of 1 for records where the right-high address range field has an invalid value

DRAFT SAMPLE

12. This check looks to see if the address range value for the low address is a higher value than the high address.

    On the Centerline Fallout Report, the field LOGreaterThanHI will have a value of 1 for records where the left-low value is greater than the left-high value.

13. This check looks for any road centerlines that have zero values in all four address ranges fields. These records could be road segments that were not addressed and require address ranges. They could also be valid attribute values for road segments such as 'on' and 'off' ramps.

    On the Centerline Fallout Report, the field RangeContainsZeros will have a value of 1 for records where the four address ranges fields have zero values.

14. This check looks for records where there are either even address ranges or odd address ranges exist for both the left and the right address ranges.

    On the Centerline Fallout Report, the field BothSidesOddorEven will have a value of 1 for records where left and right values are either both even or both odd.

15. This check lists the records that have possible repeated addresses within the address ranges of multiple segments. This would indicate a possible overlapping address range situation across road segments.

    On the Centerline Fallout Report, the field RangeOverlap will have a value of 1 for records where there are potential range overlaps. If a range overlap is detected, all records containing the overlap will be flagged. In most cases this flag indicates two ranges with an overlap but it could indicate more than two ranges with an overlap. Common examples are duplicated records that need to be reduced to one.

16. This check flags any street type suffix values that are not recognized as values within the USPS Publication 28 standard values.

    On the Centerline Fallout Report, the field STSNoMatch will have a value of 1 for records where there are unrecognized street type suffix values.

17. This check reviews all of the dangles by running a topology on the road centerlines and determines if any of the dangles are within a 10 feet of another road centerline segment. In almost all cases, these are most likely dangles that should be snapped to another road. The 10 foot buffer was used because that is the spatial accuracy tolerance of the road centerlines. However, there could be more dangles within distances to another centerline greater than 10 feet that should also be snapped and reviewed by local GIS staff in more detail.

18. This check determines if there are any road centerline segments that cross another road centerline segment without having an intersection.

DRAFT SAMPLE

19. This reports all flagged Centerline records. This is a total of all of the flagged errors for checks 4 thru 18. This count shows the number of GIS road centerline records that require a modification to clear any of the set flags from checks 4 thru 18.

20. This figure represents the overall percentage of accurate records within the GIS road centerlines dataset. This takes the total number of centerlines and subtracts the number of flagged errors to find the number of valid records. Then determines the percentage of accuracy based on the number of valid records against the total centerline records.

21. This line shows the spatial accuracy score based on a total of 10 points.

    Poor – 0 points, Fair – 5 points, Good – 10 points

22. This line shows the line direction score based on a total of 5 points.

    Poor – 0 points, Fair – 3 points, Good – 5 points

23. This line shows the score for the presence of Municipality Name fields, left and right, based on a total of 5 points.

    Absent – 0 points, Incomplete – 3 points, Complete – 5 points

24. This line shows the score for the presence of Emergency Service Zone number fields, left and right, based on a total of 5 points.

    Absent – 0 points, Incomplete – 3 points, Complete – 5 points

25. This line shows the score of the GIS road centerline checks. This takes the percentage reported in line 20 and assigns a score out of 75 based on that percentage.

26. This line shows the overall score of the road centerline data assessment by combining the score of the spatial accuracy check, the line direction check and the GIS centerline attribute validations. This is the score used to compare the county results to a baseline score of 90.

27. This check determines if the road centerline dataset has fields to track the Municipality on the left and right side of the centerline, is it the municipality name or the postal community name that is being used as the value.

28. This check determines if the MSAG table has a field to track the Community name and is it the municipality name or the postal community name that is being used as the value.

29. This check looks for road centerline address ranges that might be using potential ranges, typically buffered out to a high range ending in '99'. The results of this check are not factored in to the overall score but just a flag that these potential ranges could exist within

DRAFT SAMPLE

the dataset. The ranges are acceptable for the system, however it is recommended over time that these ranges be updated to represent actual ranges for the addresses along each road segment to improve accuracy of geocoding.

30. These figures show the results of comparing the GIS road centerlines with the MSAG table. The number or records under 'No Match' are GIS road centerline records that did not have a matching road name in the MSAG table. The number of records under 'Match' are the number of GIS road centerline records that did have a valid match within the MSAG table. A street name match occurs when all the street name fields (Pre-Directional, Street Name, Street Type, and Post-Directional) all match the associated street name fields in the MSAG table.

    The 'No Match' errors correspond to all of the records in the Centerline Fallout Report in which the STINotExistsInMSAG field is flagged with a 1. This represents the number of Centerline records in which the Street Info does not exist in the MSAG. Records in the MSAG that did not have all required fields or range errors were not included in this match.

31. These figures show the results of comparing the MSAG records with the GIS road centerline records. The number or records under 'No Match' are MSAG records that did not have a matching road name in the GIS road centerlines attribute table. The number of records under 'Match' are the number of MSAG records that did have a valid match within the GIS road centerline attribute table records. A street name match occurs when all the street name fields (Pre-Directional, Street Name, Street Type, and Post-Directional) all match the associated street name fields in the GIS road centerlines.

    The 'No Match' errors correspond to all of the records in the MSAG Fallout Report in which the STINotExistsInCent field is flagged with a 1. This represents the number of MSAG records in which the Street Info does not exist in the GIS road centerlines. Records in the GIS road centerlines that did not have all required fields or range errors were not included in this match.

32. These figures show the results of comparing the GIS road centerlines with the MSAG table. The number or records under 'No Match' are GIS road centerline records in which all possible addresses within a centerline record does not exist within the ranges in the associated MSAG record. The number of records under 'Match' are the number of GIS road centerline records in which all of the possible addresses with the centerline address ranges did exist within the MSAG records.

    The 'No Match' errors correspond to all of the records in the Centerline Fallout Report in which the PAPNotExistsInMSAG field is flagged with a 1. This represents the number of Centerline records in which some of the possible address ranges in the road centerline do not exist in the MSAG. Records in the MSAG that did not have all required fields or range errors were not included in this match.

33. This figure reports the total number of records in the MSAG.

DRAFT SAMPLE

34. This figure reports all flagged Street Info/Community records. At least one of the following flagged fields in the MSAG Fallout Report are set as 1 to be included in this total:

    MissingSTN – No street name value in the street name field
    MissingMCN – No community name value in the community name field
    STSNotRecognized – Street Type Suffix was not standardized to USPS publication 28 standards and these records will need to be updated in the MSAG and also the ALI database. (e.g. AV instead of AVE) This flag indicates the change was made before comparing the record to the GIS road centerlines or address/structure points.

35. This check reports all errors associate with the address ranges in the MSAG records. At least one of the following flagged fields in the MSAG Fallout Report are set as 1 to be included in this total:

    MissingLowRange – No value in the low range field
    MissingHighRange – No value in the high range field
    RangeContainsZeros – The values in the low and high range fields are zero
    LowGreaterThanHigh – The low range value has an address range that is higher than the high range value
    RangeOEBError - The OEB field did not match the range values provided. For example, OEB was 'O' and one of the range values was even.
    RangeNotNumeric – The value in the high or low address range fields is not a numeric value. It is either blank, null or contains a character value.

36. This check looks for any MSAG records in which the range overlaps the ranges in another MSAG record along the same road.

    In the MSAG Fallout Report, these errors correspond to the rows in which the RangeOverlap flagged field is set as 1.

37. This represents to total of flagged errors from checks 34, 35 and 36. This count shows the number of MSAG records that require a modification to clear any of the set flags from checks 34, 35, and 36.

38. This check lists the number of addresses within the structure points layer that was provided that did not have matching street names and address ranges in the road centerlines layer that was provided. In the Structure Fallout Report, the ExistInCENT field with a value of 1 are the structure points that matched and the null values are the structure points that did not have a match in the road centerlines. The ExistInMSAG field with a value of 1 indicates the structure points that matched against the records in the MSAG table and the NULL values are the structure points that did not have a match in the MSAG.

DRAFT SAMPLE