Monroe County Asset Inventory
Sign Matching

Prepared for:
Monroe County, New York

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1.0 Executive Summary

1.1 BACKGROUND

Monroe County is located in western New York State and is responsible for the administration of approximately 680 miles of road network. In addition, Monroe County is responsible for maintaining road signs within their network.

In 2007 and 2009, Stantec Consulting Ltd. (Stantec) performed Pavement Condition Assessments for the County including surface distress, roughness and digital video data collection, as well as sign asset extraction.

Additional discussion with the County uncovered a need to have sign assets from a historical work management and asset inventory database linked to the data collected by Stantec.

In 2012, Stantec was contracted by Monroe County to link the County's existing Asset Inventory table to sign data that Stantec extracted from the digital video collected in 2010 and 2011.

1.2 PROJECT SCOPE AND OBJECTIVES

Signs from the asset inventory were located along routes using the street layer provided by Monroe County. Where possible, signs from asset inventory table will be linked to the data collected by Stantec in 2010 and 2011. Additional stop sign assets from intersecting roads were collected and integrated into the database developed from the 2010/2011 data extraction project.

1.3 REPORT ORGANIZATION

This report is divided into four sections:

- Section 1 provides an introduction and overview of the project scope and objectives.
- Section 2 presents an overview of the project methodology.
- Section 3 summarizes the results of the sign matching process.
- The conclusions are provided in Section 4.

2.0 Methodology

Several processes were used to conduct matching of Monroe County's sign inventory data:

- First, the data was geographically associated to the street network by using linear referencing. Linear referencing is a system in which the locations of features are identified by a relative measure along a linear element (e.g. milepost along a road).
- Second, automated matching was conducted to match the asset inventory table to sign data collected by Stantec. Manual matching and QC was conducted to verify the automated procedure and to match signs that were not matched.
- Finally, additional stop signs at intersections of County roads were identified from the asset inventory table, collected from the original 2010/2011 video data, and added to the 2010/2011 asset dataset.

2.1 LOCATING SIGNS ALONG ROUTES

Linear referencing was used to convert the streets layer to a route, using the "segroute" attribute to define each unique element of the route. Converting this layer to a route creates the ability to display points along the route based on a distance measure.

In order for each record of the asset inventory table to be displayed along their respective route, the table was modified through several steps.

- The asset inventory table's street names were standardized to match the street names in the streets layer.
- The "segroute", route identifier was imported into the asset inventory table based on the street name match between the two datasets.
- Missing distance measures were inserted based on cross street location along the route, determined from the streets layer.
- The distance measure was used to display the signs along each sign's route. This process allowed the asset inventory signs to be converted into a shapefile with x-y coordinates.

Once as many signs as possible were matched to a route, the "sign_type" attribute from the asset inventory table was matched to the MUTCD codes used during 2010 and 2011 asset collection. These codes were used to compare the location of each sign from the asset inventory table to the location of each sign from collected data in order to determine a match.

2.2 AUTOMATED SIGN MATCHING

FME Workbench was used to match signs automatically based on their proximity to signs collected by Stantec. A stepwise approach was used to match the signs. The location of asset inventory signs were compared to the location of collected signs. If the criteria (below) were satisfied, then the signs from each data set resulted in a match. If it did not pass the first criteria, the unmatched signs were used in the next step until all criteria were tested.

- First, an initial matching tolerance of 100 feet was used to match signs where the sign type code matched. Signs from both layers that had matching sign codes and were within 100 feet were matched to their closest matching sign.
- Second, remaining unmatched signs, from both layers, were matched using a 200 foot tolerance.
- Third, signs not matched in the previous step were matched using a tolerance of 300 feet.
- Fourth, any remaining unmatched signs were matched if the sign code prefix matched and were within 75 feet of each other. For example R10-6 and R10-6a share the ‘R10-6’ and have similar meanings.
- Fifth, any remaining unmatched signs were matched to any sign within 30 feet, regardless of sign code.
- Finally, all unmatched stop signs (R1-1) were flagged for manual data extraction.

Matches were verified to ensure the tolerances were valid. The automated sign matching process required additional manual matching to collect unmatched signs that did not pass any of the above tolerance criteria.

2.3 MANUAL SIGN MATCHING

Manual sign matching was used to confirm the location of automated matches and to match unmatched signs. Unmatched signs did not pass the automated matching criteria for various reasons. The sign code may have been incorrect (e.g. typos etc.). The sign’s distance measurement may not reflect the real location along the route, resulting in a match distance greater than the 300 foot tolerance.

Reviewing along each route, the location of each unmatched sign was assessed. If a match was found by the operator, the “IDsign” was updated for each previously unmatched sign. A match was assigned where possible; otherwise the sign was not matched.

2.4 STOP SIGN COLLECTION

Unmatched stop signs at intersections of Country roads and related 4-way panels were collected using the T3D Analyst 4.5 software. Both the x-y location of each sign from the asset inventory table and the street layer was used to locate the correct sign from the video. The sign was identified in the video and collected. A new “IDsign” was matched to the correct sign in the asset inventory table.

3.0 Sign Matching Results

This section summarizes the results of matching Monroe County's asset inventory sign data to the data collected during the 2007 and 2009 field survey. The original number of unmatched signs was 18347. The automated and manual matching process matched 10904 signs, which represents a match rate of 59.4%. A summary of the matching results is presented below in Table 3.1.

Table 3.1: Sign Matching Results

Comment	Count
MATCHED TO EXISTING RECORD	9049
MATCHED - NEW RECORD CREATED	1854
NOT MATCHED - ROUTE NOT ON STANTEC SURVEY LIST	495
NOT MATCHED - MISSING STREET NAME	102
NOT MATCHED - DUPLICATE SIGN	18
NOT MATCHED - CANNOT DETERMINE SIGN TYPE	3111
NOT MATCHED - CANNOT LOCATE CLOSE PROXIMITY MATCH	3522
NOT MATCHED - CANNOT LOCATE IN VIDEO	146
NOT MATCHED - CANNOT LOCATE IN VIDEO - CONSTRUCTION	1
NOT MATCHED - CANNOT LOCATE IN VIDEO - ROUNDABOUT	1
NOT MATCHED - CANNOT LOCATE STREET IN GIS NETWORK	48
TOTAL	**18347**

There are several reasons why signs could not be matched.

- 3522 signs from the counties asset inventory table were not in the proximity of sign data extracted by Stantec. Many of these signs plotted several thousand feet away from a potential match. These could not be matched to the collected data since no match could be found.

- 3111 signs could not be linked to a sign code. The counties asset inventory table contained descriptions such as "marker" and blank, which was not clear enough to be associated to a valid MUTCD. In addition, 48 signs could not be located because the street name couldn't be located on the GIS, and 102 because of missing road names associated with the sign. 44 sign records had road names with no match on the GIS.

- 495 signs were located along a section of road that was not tested by Stantec in 2007 or 2009.
- 18 signs are potential duplicates of another “IDsign”.
- 1854 signs were logged from the video. 495 could not be located in the video: due to construction, a new roundabout, and visibility issues. The majority of the unmatched stop signs were completely obscured in the video and their presence could not be confirmed.

4.0 Conclusions

A linkage between Monroe County's Asset Inventory table and their street network was created. Signs were matched to data collected in 2010 and 2011 based on proximity thresholds.

Additional signs outside the 2010/2011 scope were collected, specifically unmatched R1-1 and R1-3P signs from Monroe County's Asset Inventory.

As part of the 2012 Monroe County Sign Locating project, 10903 signs were matched from a dataset of 18347. This represents a 59.4% match rate. Many of the unmatched signs did not have a reasonable match within close proximity. An equal proportion of signs did not have a sign type that could be determined (either "marker" or blank). The majority of stop signs (93%) that were not collected in 2010/2011 have now been collected and matched to the asset inventory table.

5.0 Appendix

Table 5.1: Sign_XY Attribute Descriptions

Attribute Name	Data Type	Description
ObjectID	AutoNumber	Unique ID
IDSign	Number	Sign Asset Identification number
Post_ID	Number	Post Asset Identification number
MUTCD	Text	MUTCD sign code
NUMBER_OF_SIGNS	Number	Number each unique type of sign per post
FLOURS	Text	Yes, if sign is fluorescent
OVERSIZED	Text	Yes, if sign is oversized
COMMENT_SIGN	Text	Extracters Comments for Sign
SIGN_FACING	Text	Direction that the sign is facing
COMPKEY	Number	Foreign key for Compkey
LFRAME	Number	Left frame number used to create the asset
RFRAME	Number	Right frame number used to create the asset
TC	Number	GPS (SMPTE)Time Code if available
CHAIN1	Number	Distance information of Chain1 box in Analyst-2D window
CHAIN2	Number	Distance information of Chain2 box in Analyst-2D window
SEQUENCE	Text	AVI file name used to create the asset
HEADING	Number	GPS trace heading
X	Number	Longitude coordinate of the created point related to the asset
Y	Number	Latitude coordinate of the created point related to the asset
Z	Number	Altitude of the created point related to the asset
X1	Number	Position of the point-pixel in X axis for the Left Frame
Y1	Number	Position of the point-pixel in Y axis for the Left Frame
X2	Number	Position of the point-pixel in X axis for the Right Frame
Y2	Number	Position of the point-pixel in Y axis for the Right Frame
SUPPORT_TYPE	Text	Type of post support
NUMBER_OF_SUPPORTS	Number	The number of supports present
LOGGED_ON	Date/Time	Date of logging
COMMENT_POST	Text	Extracters Comments for Post
STREET__SIGN	Text	Yes, if post has Street Name Sign
HYPERLINK	Text	Hyperlink to image of sign
MATCHED	Number	If IDSign is matched to a Compkey, value is 1