

Using GIS to Analyze ITS Traffic Count Data

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ITS Traffic Count Data

- * Data are collected automatically by sensors compared to tradition traffic count collection.
- * Data are available everyday.
- * Data are collected at high frequency, such as 5-minute interval.
- * Data includes multiple items such as speed, volume, and occupancy.

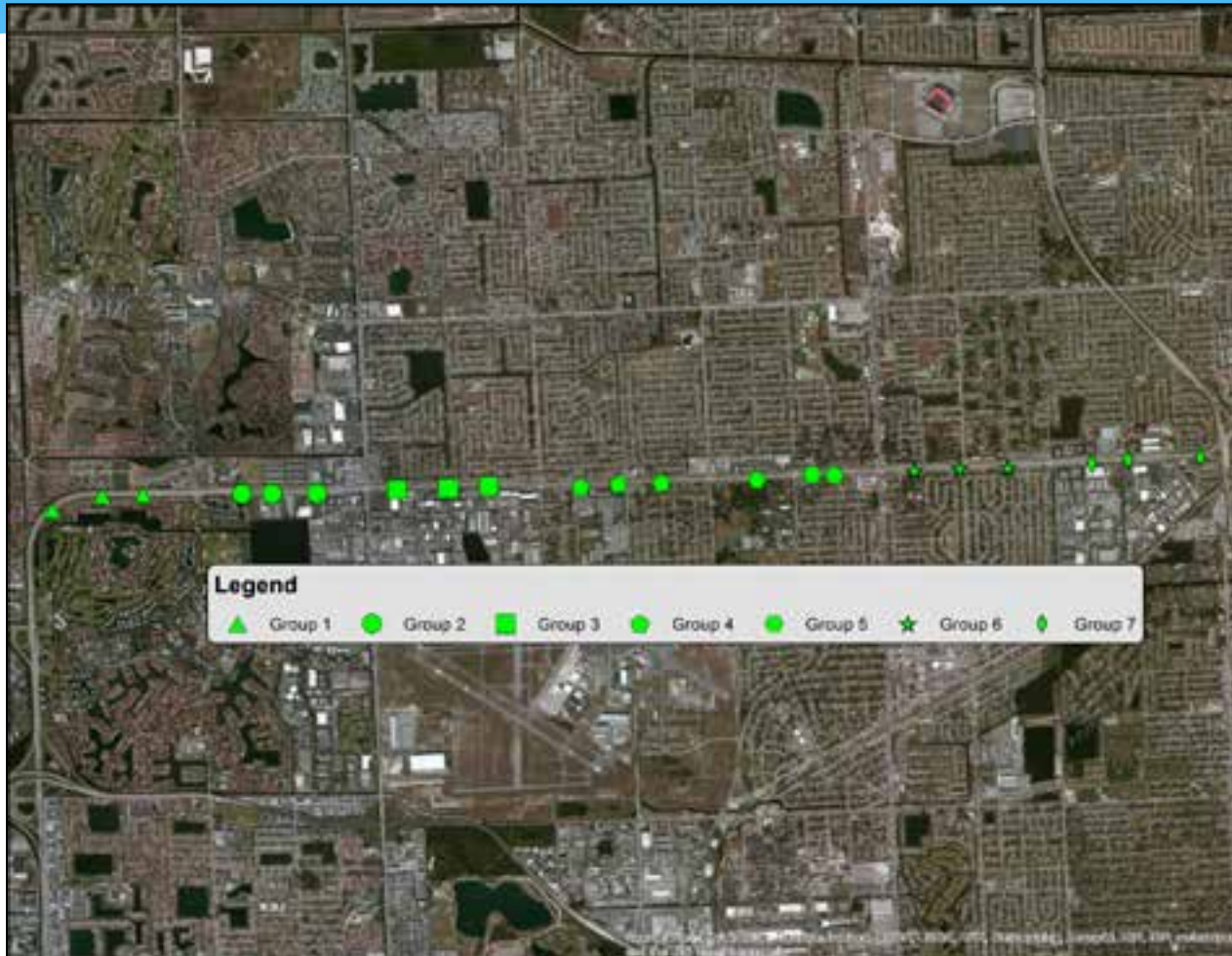
Why Analyze ITS Traffic Count Data

- * Analyze traffic flow patterns (AM and PM peaks).
- * Identify traffic incidents.
- * Figure out how other factors (e.g. weather) affect traffic flow.

Traffic Count Data Preprocessing

- * Categorize data by traffic direction
- * Group data between interchanges

Traffic Count Data Locations

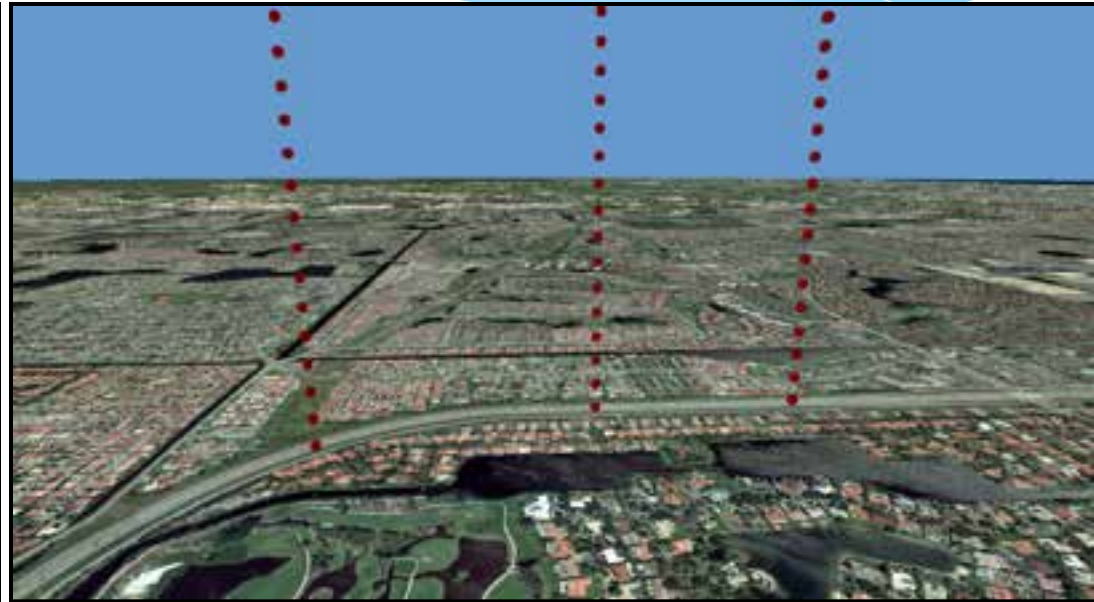


East-Bound Traffic and 7 Groups

Traffic Count Data Characteristics



Data overlap at each location



Every data point at each location has different stamp

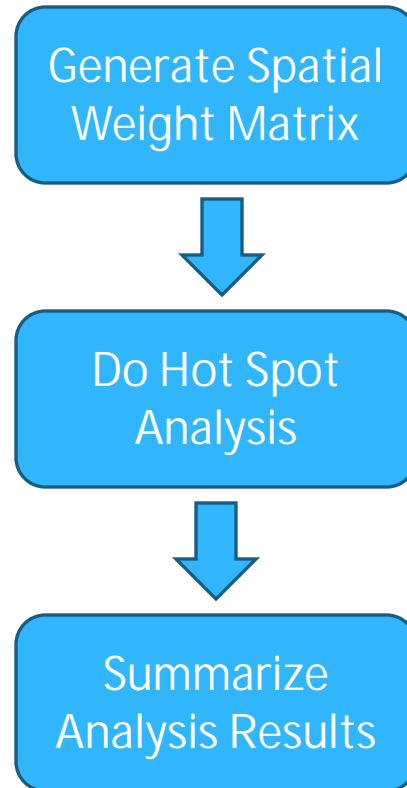
Traffic Count Data Structure

- * Data Frequency: 5-minute interval
- * Data Item
 - * FWY_SPD: Speed
 - * FWY_VOL: Volume
 - * FWY_OCC: Occupancy
 - * SPD_CV: Coefficient of variation for speed
 - * VOL_RATIO: Ratio of max volume lane to min volume lane

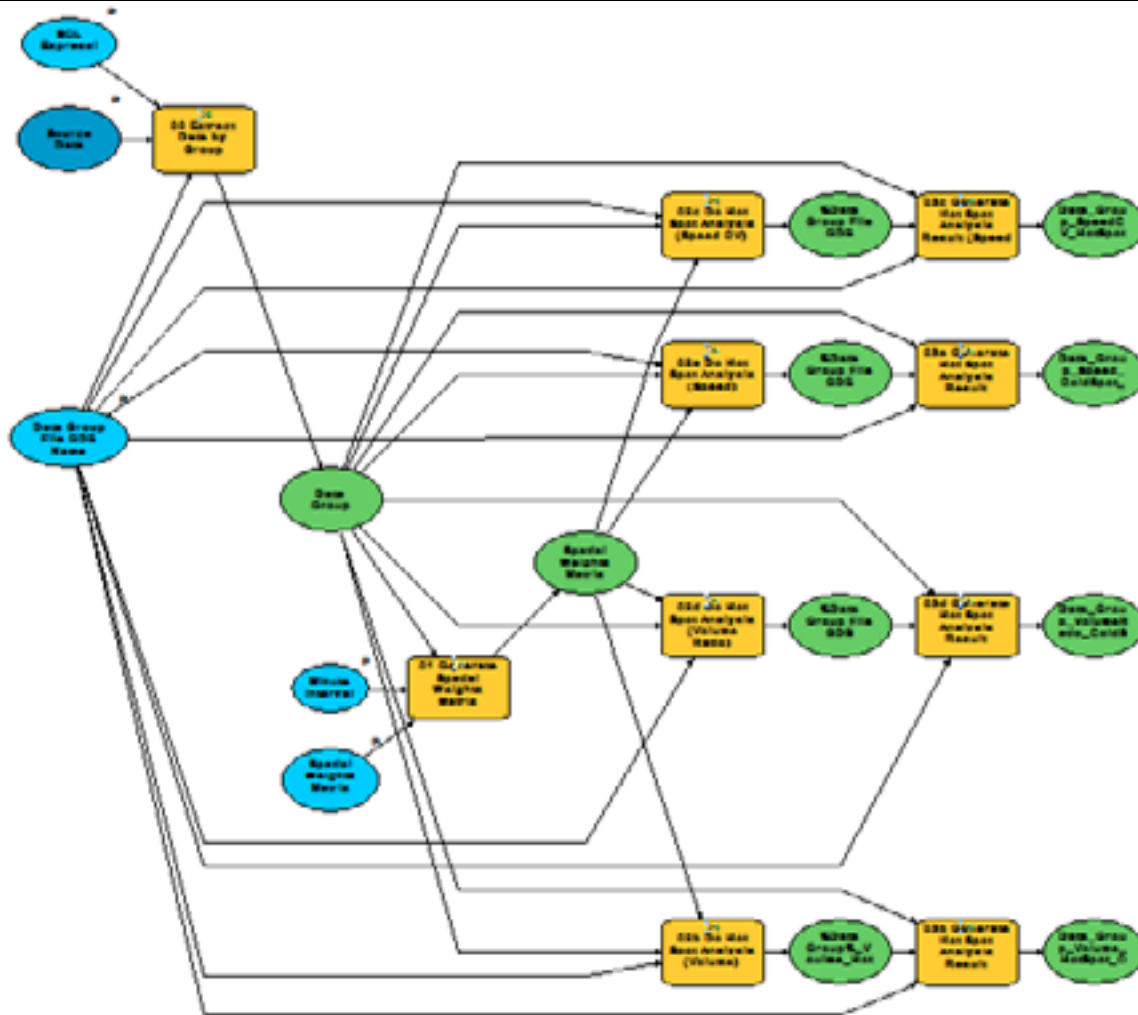
Traffic Count Data Structure (Cont'd)

DATE_	TIME_	STATION_ID	FWY_SPD	FWY_VOL	FWY_OCC	SPD_CV	VOL_RATIO
9/2/2008	8:25:00 AM	610011	25.58	177	38.8	10.58	4.11
9/2/2008	8:30:00 AM	610011	22.21	301	38.1	7.38	3.18
9/2/2008	8:35:00 AM	610011	23.22	276	40.5	12.7	5.16
9/2/2008	8:40:00 AM	610011	21.31	284	35.5	13.99	3.42
9/2/2008	8:45:00 AM	610011	26.67	243	37.5	8.4	5.24
9/2/2008	8:50:00 AM	610011	23.16	208	42.1	9.4	6.24
9/2/2008	8:55:00 AM	610011	26.11	235	37	11.19	2.78
9/2/2008	9:00:00 AM	610011	35.28	167	21.4	13.48	1.77
9/2/2008	9:05:00 AM	610011	38.7	415	11.1	11.21	1.35
9/2/2008	9:10:00 AM	610011	52.77	282	9.5	7.15	1.27

Traffic Count Data Processing

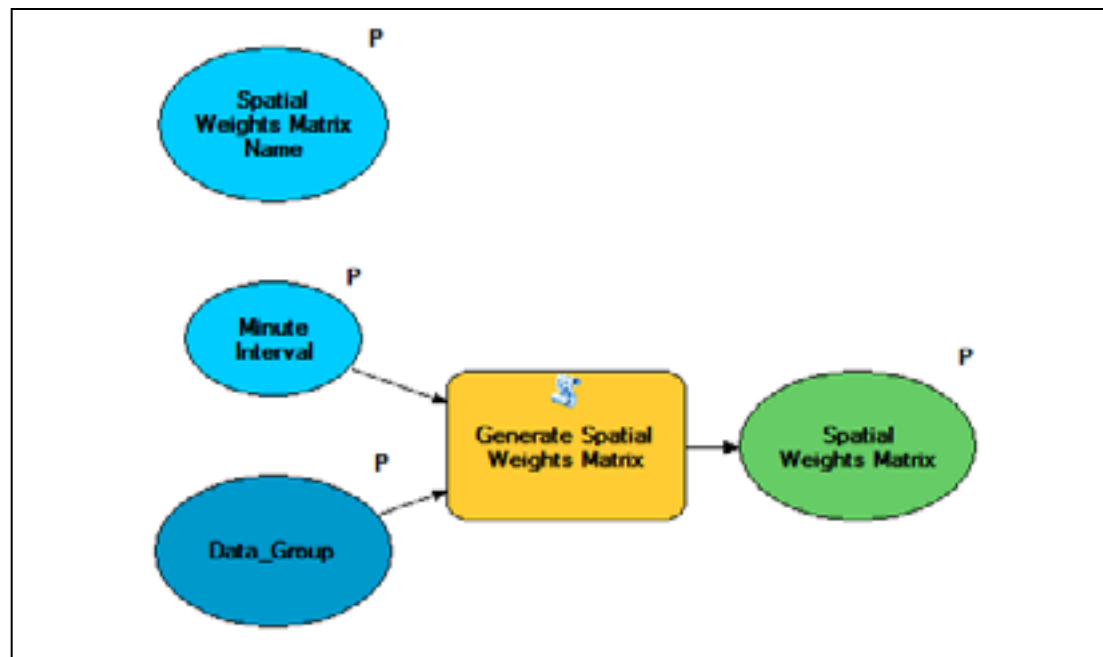


Traffic Count Data Processing Model



Generate Spatial Weight Matrix

- * Time Interval: 60, 90, 120, 150, 180, 210 minutes
- * Critical Distance: Determined by tool



Do Hot Spot Analysis

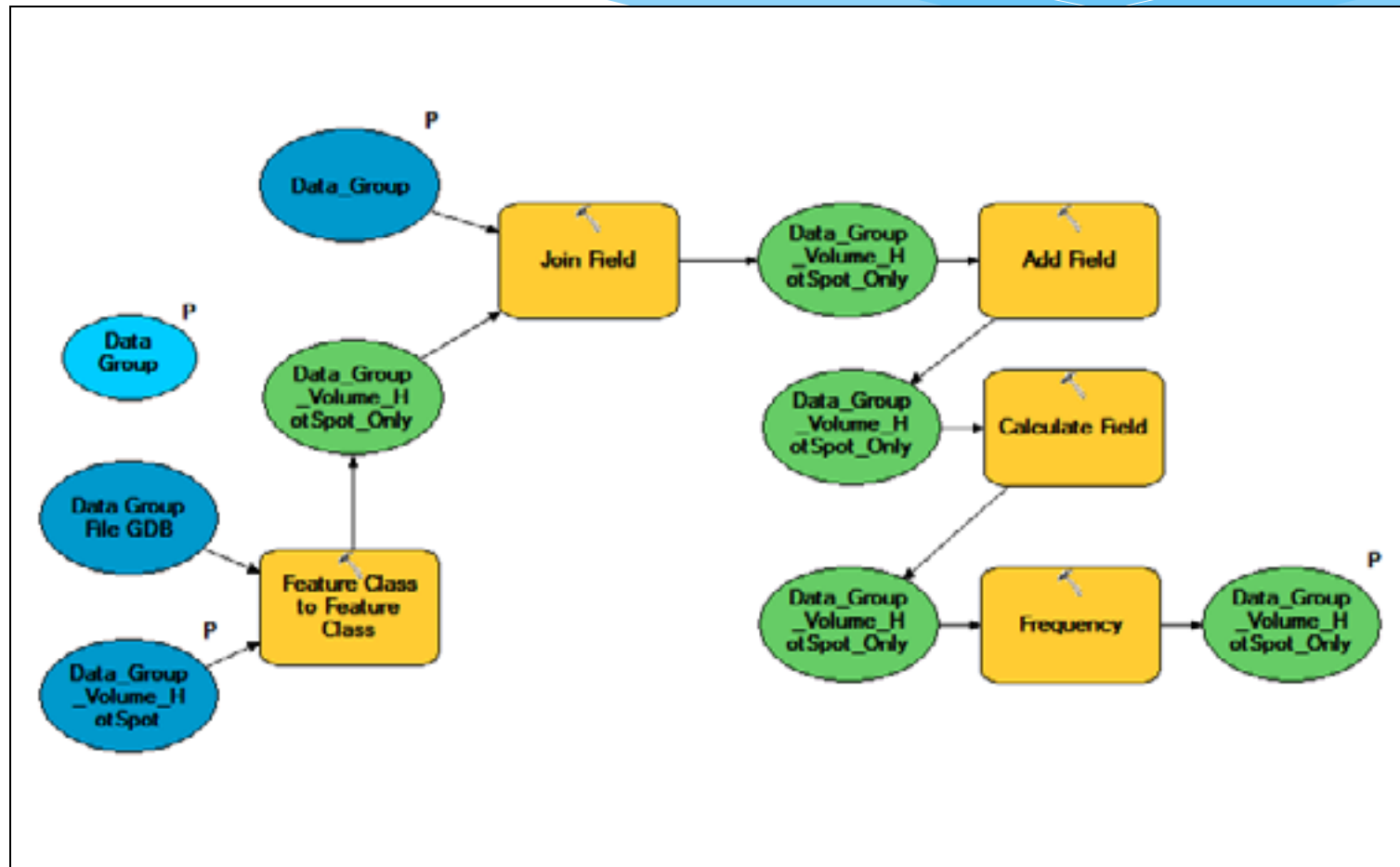
- * Analysis is based on each Spatial Weight Matrix generated



Summarize Analysis Results

- * Count the number of hour in the following cold or hot spots.
 - * Speed: Cold Spot
 - * Volume: Hot Spot
 - * Speed Variance: Hot Spot
 - * Volume Ratio: Cold Hot

Summarize Analysis Results (Cont'd)



Summarize Analysis Results (Cont'd)

- * High z-score and small p-value: Spatial clustering of high values.
- * Low negative z-score and small p-value: Spatial clustering of low values.

DATE TIME	FWY VOL	GiZScore	GiPValue
10/6/2008 6:05:00 AM	240	1.343976	0.170956
10/6/2008 6:10:00 AM	293	1.056034	0.063449
10/6/2008 6:15:00 AM	344	2.389728	0.016861
10/6/2008 6:20:00 AM	349	2.891689	0.003832
10/6/2008 6:25:00 AM	368	3.10253	0.001919
10/6/2008 6:30:00 AM	364	3.710982	0.000206
10/6/2008 6:35:00 AM	385	4.087453	0.000044
10/6/2008 6:40:00 AM	376	4.631194	0.000004
10/6/2008 6:45:00 AM	390	4.834625	0.000001
10/6/2008 6:50:00 AM	415	5.154842	0
10/6/2008 6:55:00 AM	408	5.475058	0
10/6/2008 7:00:00 AM	367	5.799602	0
10/6/2008 7:05:00 AM	451	6.05491	0
10/6/2008 7:10:00 AM	446	6.14956	0
10/6/2008 7:15:00 AM	453	6.334739	0
10/6/2008 7:20:00 AM	483	6.418957	0
10/6/2008 7:25:00 AM	417	6.373195	0
10/6/2008 7:30:00 AM	425	6.483308	0

Z-score > 1.96 (95% confidence level),
clustering of high values

Summarize Analysis Results (Cont'd)

* Hour count based on 95% confidence level

FREQUENCY	TIME_COUNT
8	0
12	1
12	2
2	3
16	6
36	7
32	8
12	9
3	10
11	11
11	12
12	13
20	14
16	15
12	16
12	17
12	18
12	19
12	20
11	21
8	22

Speed

FREQUENCY	TIME_COUNT
24	6
36	7
36	8
16	9
23	10
33	11
24	12
24	13
36	14
36	15
36	16
36	17
30	18
5	19

Volume

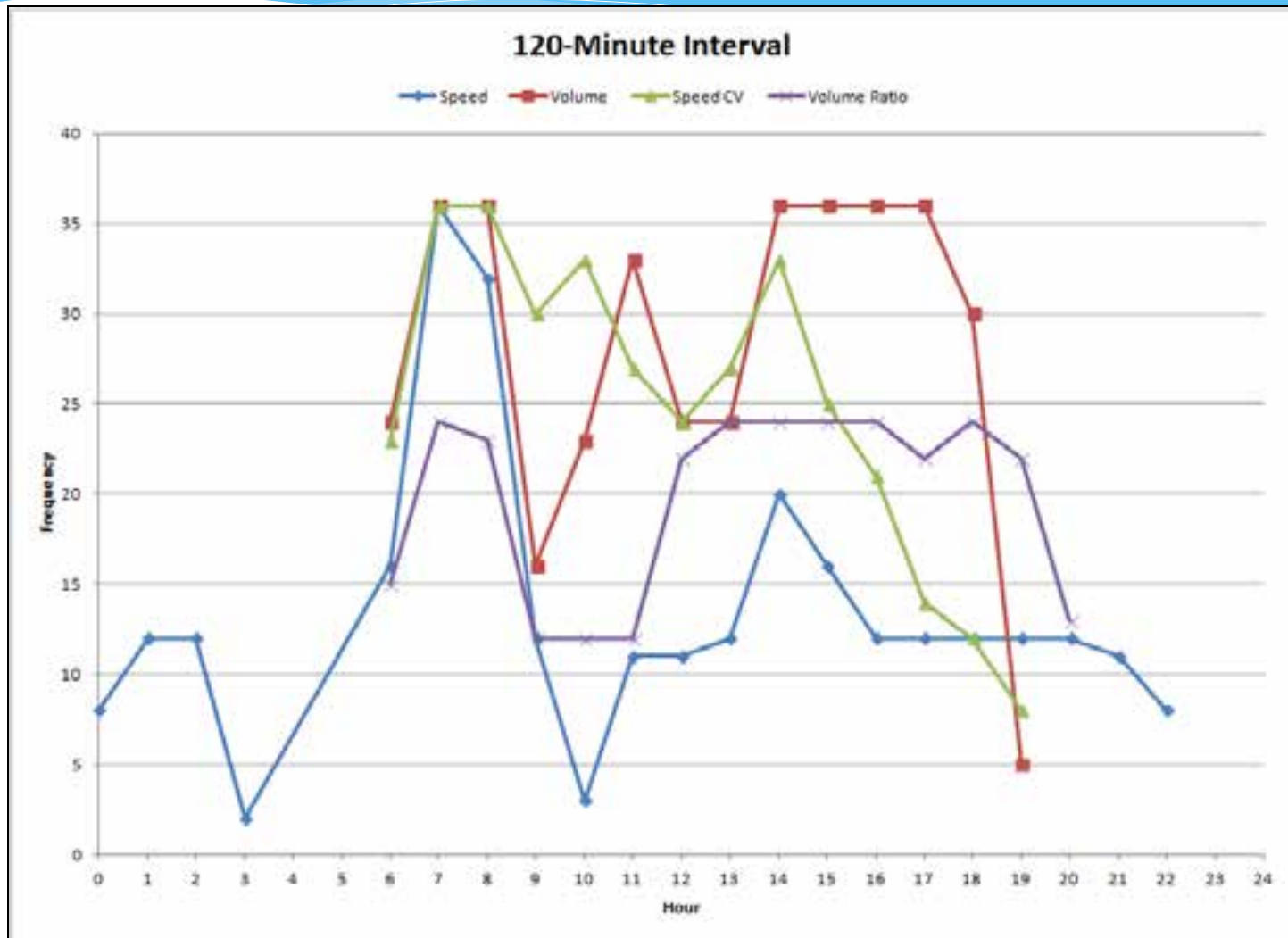
FREQUENCY	TIME_COUNT
23	6
36	7
36	8
30	9
33	10
27	11
24	12
27	13
33	14
25	15
21	16
14	17
12	18
8	19

Speed Variance

FREQUENCY	TIME_COUNT
15	6
24	7
23	8
12	9
12	10
12	11
22	12
24	13
24	14
24	15
24	16
22	17
24	18
22	19
13	20

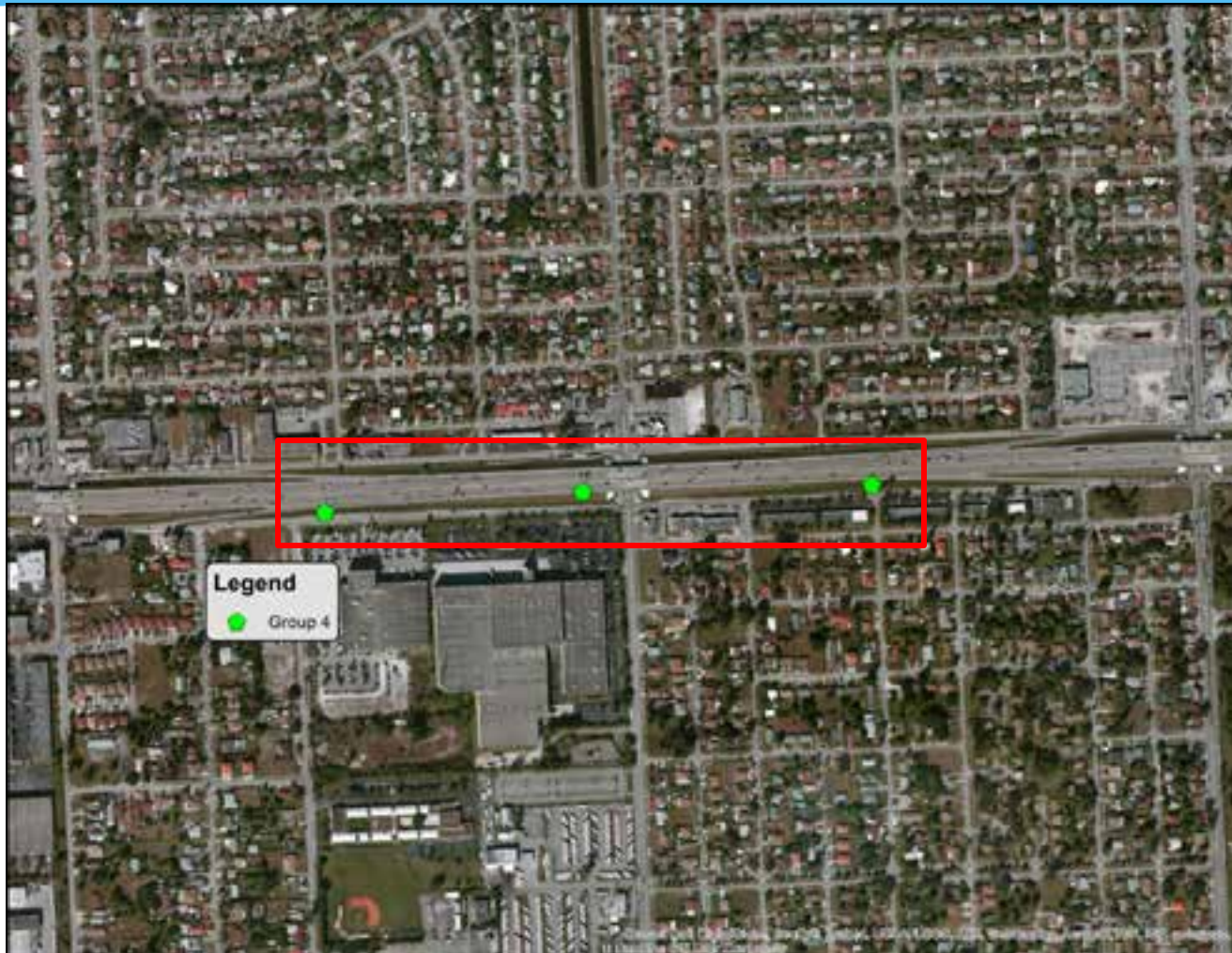
Volume Ratio

Summarize Analysis Results (Cont'd)



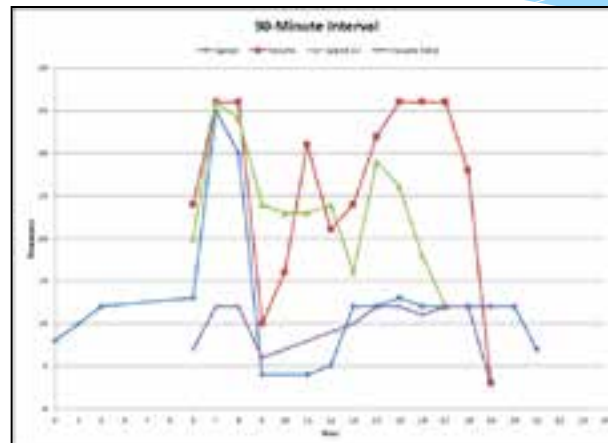
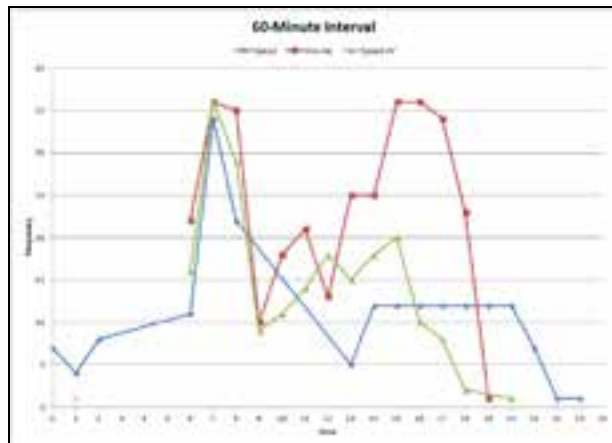
Compare Results

Analysis Locations



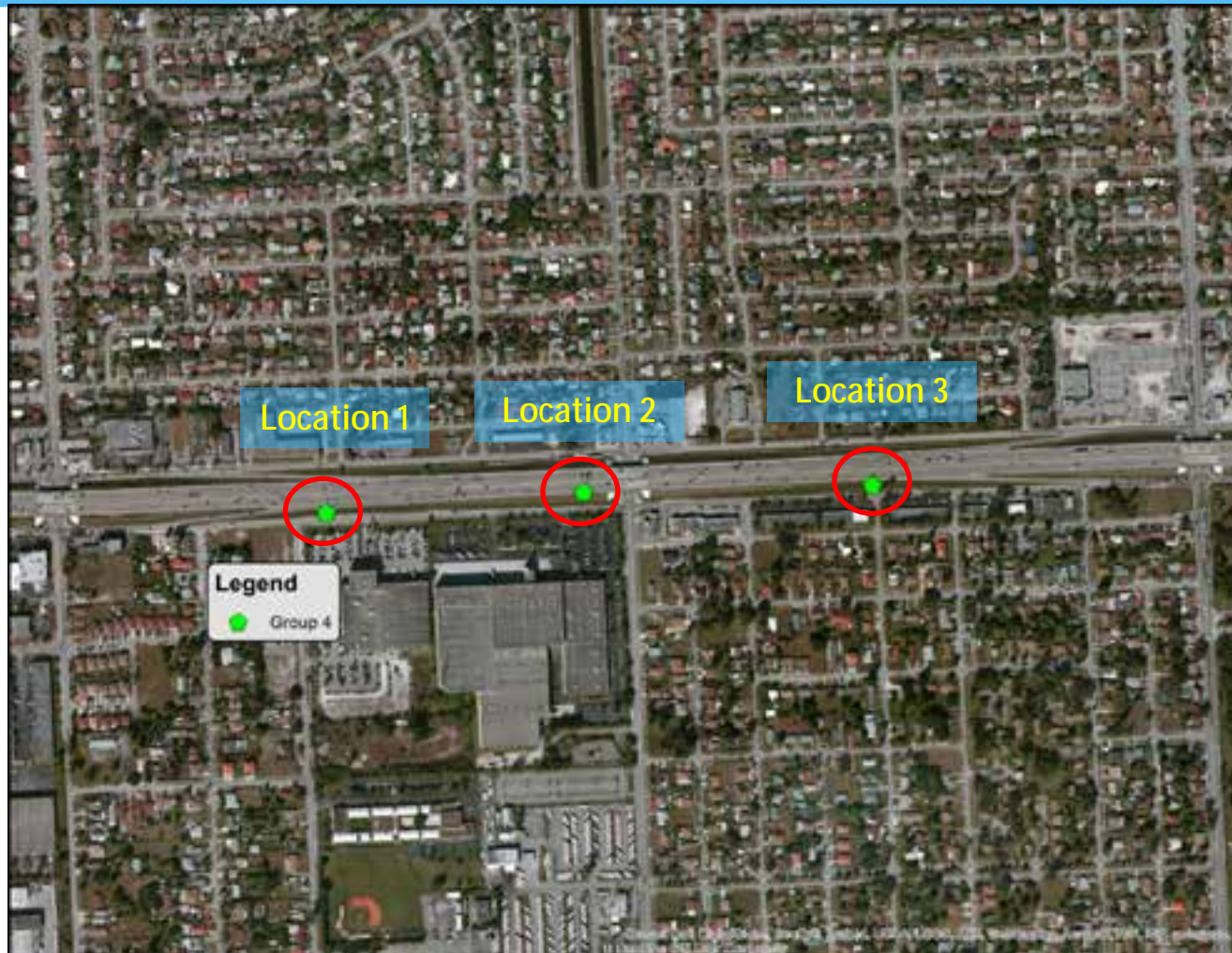
Compare Results (Cont'd)

Speed, Volume, Speed Variance, Volume Ratio
Frequency Chart at Different time Interval



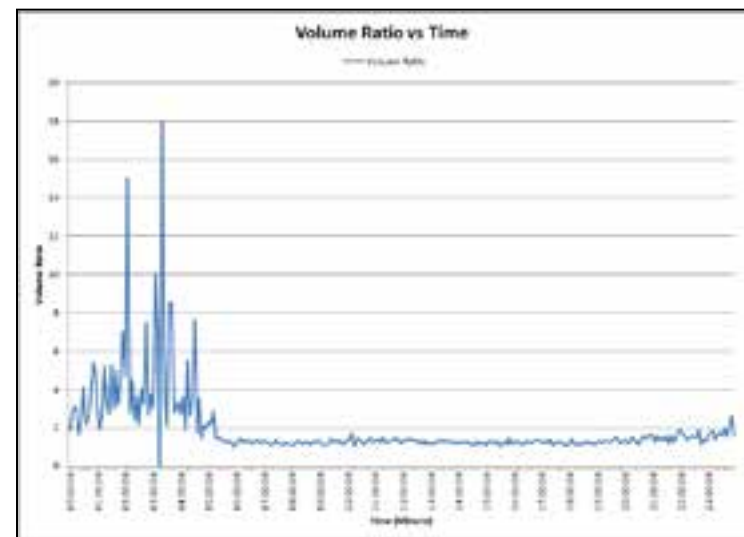
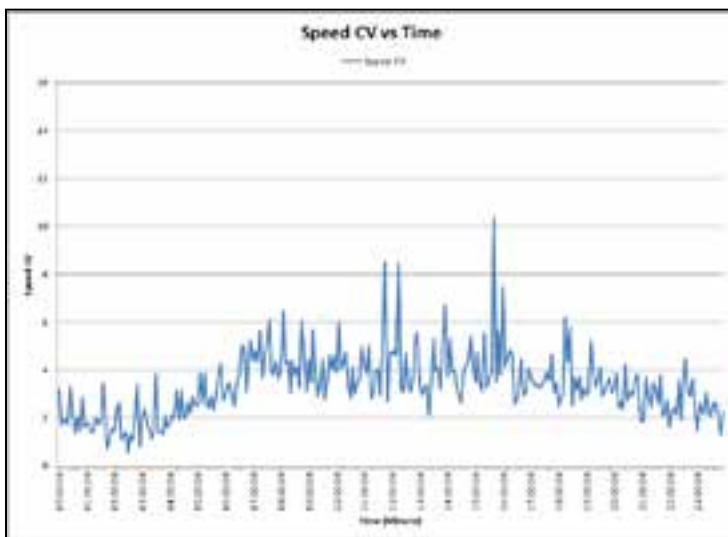
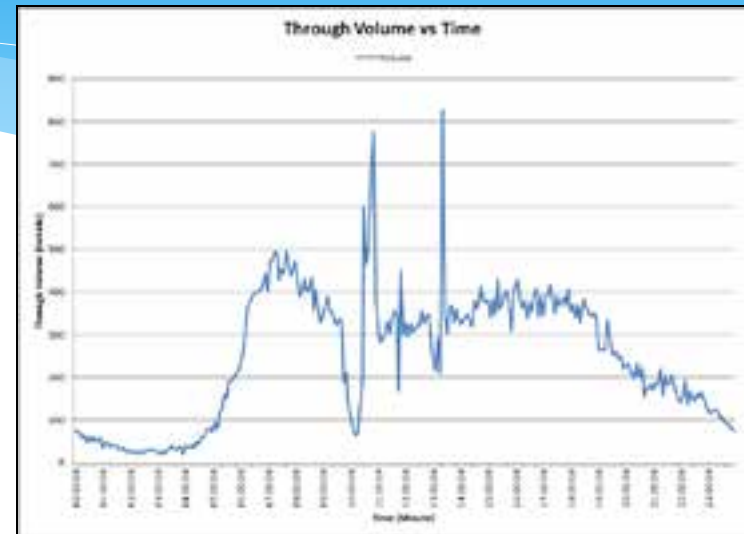
Compare Results (Cont'd)

Locations



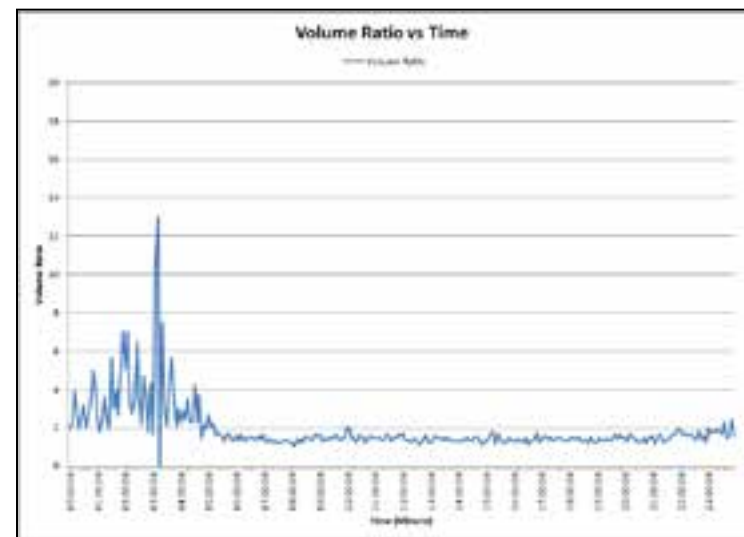
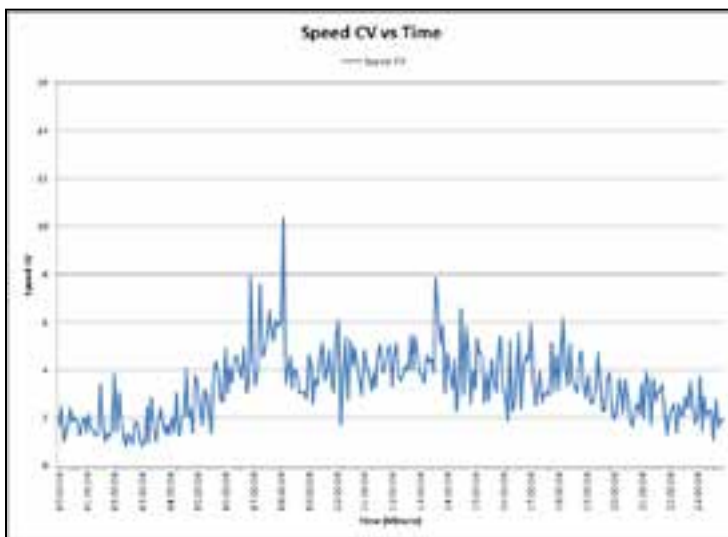
Compare Results (Cont'd)

Speed, Volume, Speed Variance, Volume Ratio Time of Day Chart @ Location 1



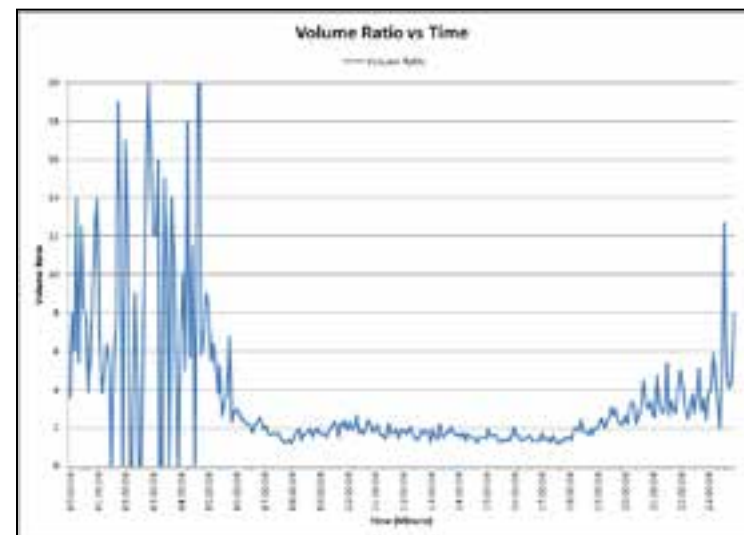
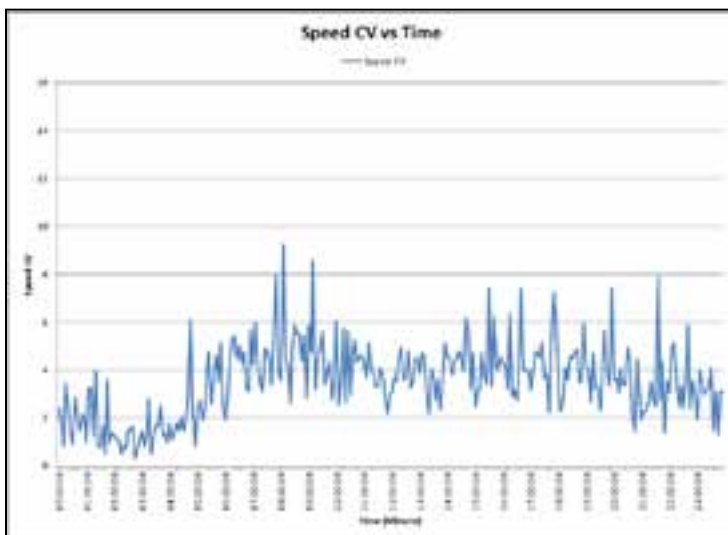
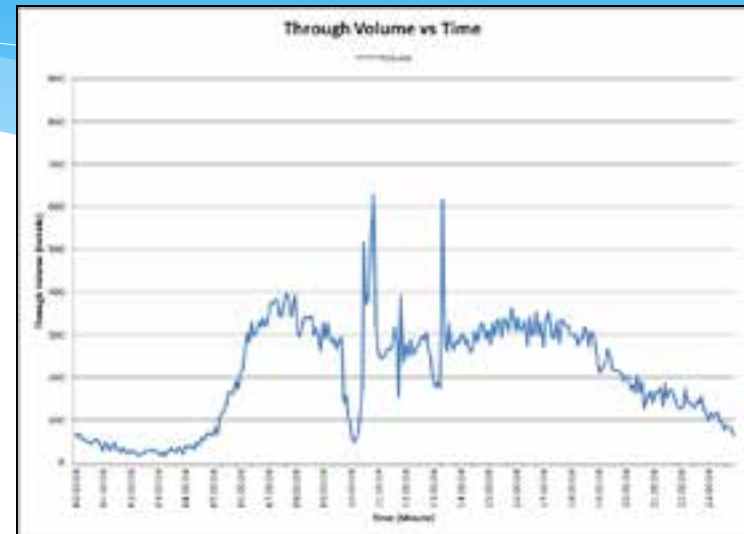
Compare Results (Cont'd)

Speed, Volume, Speed Variance, Volume Ratio Time of Day Chart @ Location 2



Compare Results (Cont'd)

Speed, Volume, Speed Variance, Volume Ratio Time of Day Chart @ Location 3



Conclusion

- * Volume is a good indicator to identify peak hour traffic.
- * 120-minute is the recommended time interval to do the analysis.

FREQUENCY	TIME_COUNT
24	6
36	7
36	8
16	9
23	10
33	11
24	12
24	13
36	14
36	15
36	16
36	17
30	18
5	19

← High Frequency

← High frequency

Questions

