New York State Department of Transportation
Request for Proposals
Traffic Data System (TDS) Services for NYSDOT
Contract #C037910
October 22, 2020

Attachment 22
Required Calculations

Proposer's Name: **Enter Proposer Name Here**
Date: _____

Table of Contents

Part 1: Volume Calculations for Short Counts

NYSDOT Short Count AADT Estimation Formula

- **The following formulas and processes in Part 1 (Required Volume Calculations for Short Counts) and Part 2 (Required Class Calculations for Short Counts) of this document are required and must be performed exactly as presented here. No exceptions.**

$$AADT = \frac{\sum_{j=1}^{24} \left(\frac{1}{d_j} \sum_{i=1}^{d_j} H_i \right) F_{axle}}{R_{Seasonal}}$$

H_i = Traffic volume count for hourly interval i of the day

F_{axle} = Axle Factor for the station based on Region and Functional Classification

$R_{Seasonal}$ = Seasonal ratio for the station based on Factor Group and the month of the count

d_j = Days of the week collected within interval j

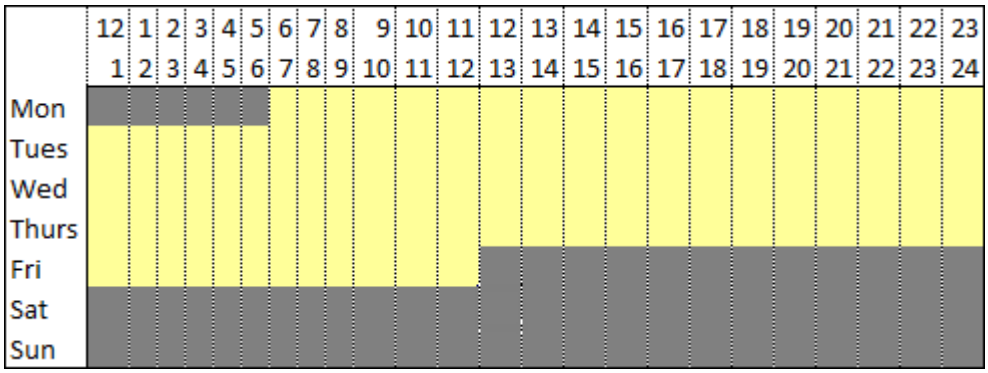
j = Hourly intervals

Step 1: Collect Data at Short Count Sites

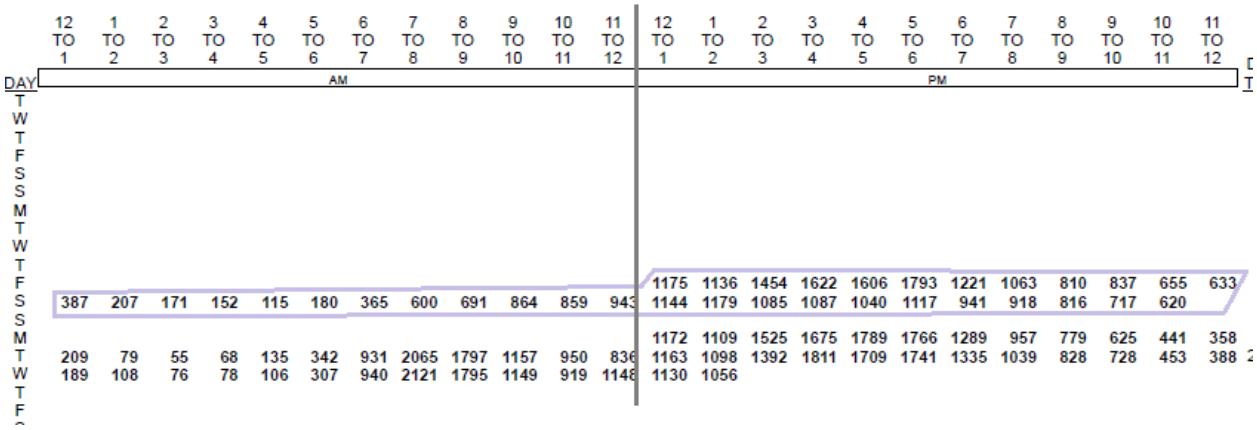
- Short count sites require a minimum of 72 hours of data collection.
- Data is typically collected for periods of 3 to 7 days.
- NYSDOT defines a weekday period as the time interval from Monday 6 AM – Friday 12:00 Noon. This weekday period is known as a **NYSDOT Workweek**.

Fig. 1

- **Note:** Data collected on weekends or outside of the NYSDOT Workweek is **not** used for Short Count Collections.



E.g. 1



- The data outlined would not be used in a calculation because it was taken on a weekend and on a Friday after 12PM.

Step 2: Analyze Data

- Check for the existence of erroneous data.
- Each time interval needs to have **at least 2** values.
  Reference the top header to find the ROAD NAME, STATION, REGION, FUNCTIONAL CLASS, FACTOR GROUP, COUNTY, and other information.

Fig. 2

STATION: 540010

New York State Department of Transportation
Traffic Count Hourly Report

Page 1 of 2

ROUTE #: NY 61 ROAD NAME: HYDE PARK BLVD
DIRECTION: Northbound FACTOR GROUP: 30
STATE DIR CODE: 1 WK OF YR: 38
DATE OF COUNT: 09/15/2015
NOTES LANE 0: NB APP - 2 LANES - 45 MPH

COUNT TAKEN BY: ORG CODE: R05 INITIALS: RPJ

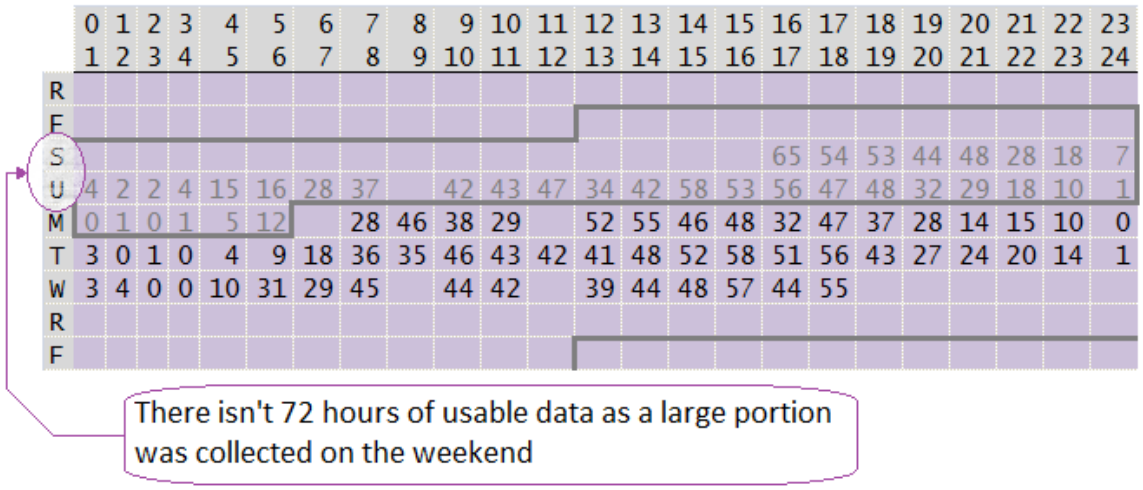
FROM: TOWN OF LEWISTON / NIAGARA F
REC. SERIAL #: BG61
PLACEMENT: 25' S of Power Authority Drw
@ REF MARKER:
ADDL DATA:
COUNT TYPE: AXLE PAIRS
PROCESSED BY: ORG CODE: R05 INITIALS: WKR

TO: RT 104 END RT 61
FUNC. CLASS: 14
NHS: no
JURIS: City
CC Stn:
BATCH ID: DOT-R5WK 38 - 2015

COUNTY: Niagara
TOWN:
LION#:
BIN:
RR CROSSING:
HPMS SAMPLE: 6935028

E.g. 2

Initially, this data looks acceptable and would probably pass **IF** most of the count wasn't collected during the weekend.



E.g. 2.1

Even though this count has some intervals missing, there are still 2 counts for the 5-to-6-hour interval. Therefore, this count is acceptable.

Any data outside the specified count interval cannot be used.

	0 1	1 2	2 3	3 4	4 5	5 6	6 7	7 8	8 9	9 10	10 11	11 12	12 13	13 14	14 15	15 16	16 17	17 18	18 19	19 20	20 21	21 22	22 23	23 24
F																								
S																								
U																	55	54	53	44	48	28	18	7
M	4	2	2	4	15	24	33	38	42	37	22	29	34	32	45	48	53	58	48	36	27	14	8	1
T	4	0	0	1	8	26	32	34	46	48	28	42	37	35	78	67	59	52	47	29	24	15	11	3
W	3	0	1	0	4																			
R								39	42	44	37	33	35	44	39	55	44	55	51	38	34	18	14	5
F	2	1	0	4	11	18	36	44	48	43	32	31	36	38	45	42	58	57	54	41	32			
S																								

This blank section is a typical counter error that is sometimes seen. One of the tubes probably got detached. The crew travelled to the site, fixed it and continued the count to get over 72 hours of data.

These 3 counts (the 78 especially) appear to be higher than their time interval counterparts. However, the counts aren't absurdly large, so removing them is not warranted. There is probably a logical reason why there was more traffic that day – such as a road closing, event or similar.

E.g. 2.2

29	104	199	171	109	135	111	102	111	138	122	141	116	86	57	52	31	20
30	86	192	138	94	121	112	102	105	148	129	103	92	67	31	42	13	13
28	75	209	160		151	108	114	117	133	130	149	117	69	51	37	13	19

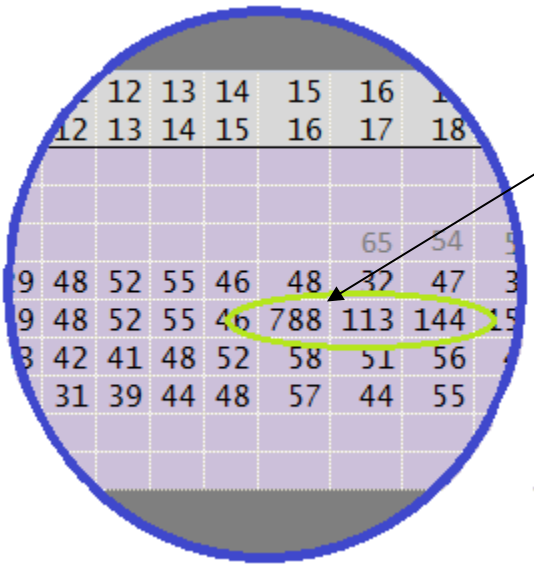
There is a trend of lower traffic on Wednesday PM, but the data is still acceptable. This may be normal as there are also slightly higher values on Wednesday AM.

E.g. 2.3

While this data is acceptable, the Monday count data contains an error which would need to be analyzed and probably edited out.

	0 1	1 2	2 3	3 4	4 5	5 6	6 7	7 8	8 9	9 10	10 11	11 12	12 13	13 14	14 15	15 16	16 17	17 18	18 19	19 20	20 21	21 22	22 23	23 24
F																								
S																								
U																	65	54	53	44	48	28	18	7
M	4	2	2	4	15	16	28	37	0	0	0	0	0	0	0	0	0	0	58	23	44	25	12	5
T	0	1	0	1	4	12	24	28	46	38	29	48	52	55	46	48	32	47	37	28	14	15	10	4
W	3	0	1	0	4	9	18	36	15	46	43	42	41	48	52	58	51	56	43	27	24	20	14	1
R	3	4	0	0	1	31	29	45	28	44	42	31	39	44	48	57	44	55						
F																								
S																								

E.g. 2.4



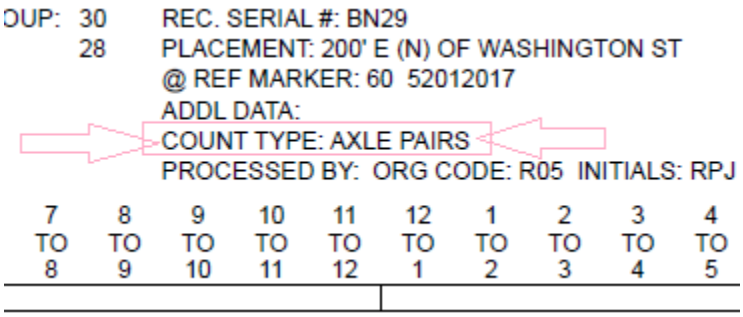
For each example, zeroes & unusually large high numbers need to be edited out, otherwise they would markedly affect the averages for those intervals.

Something is also wrong with this data as the numbers are significantly higher than other similar time intervals.

Step 3a: Determine Seasonal Adjustment Factor

- The seasonal adjustment factor is determined by the month when the count was started.
- Determine the factor by **Factor Group** and **Month**.
    - This will be listed on a table

Step 3b: Determine if an Axle Adjustment Factor is Needed



- The COUNT TYPE determines if an Axle Adjustment Factor is needed.
- If the count type is **AXLE PAIRS**, the Axle Adjustment Factor is needed.
- If the count type is **VEHICLES**, no Axle Adjustment Factor is necessary
    - Axle Factor is looked up by **Region** and **Functional Class**.

Step 4: Calculating Average NYSDOT Workweek Hours

$$AWH_j = \left(\frac{1}{d_j} \sum_{i=1}^{d_j} H_i \right) F_{axle}$$

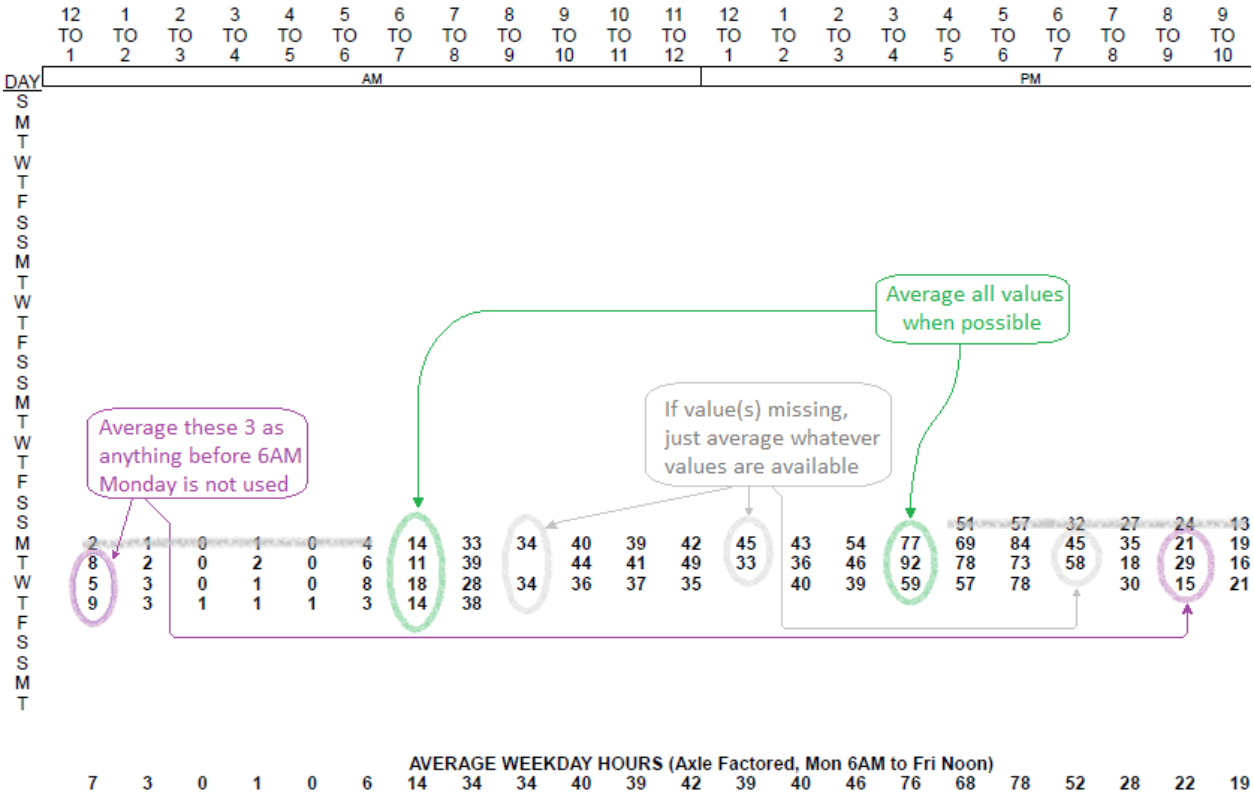
- To calculate Average NYSDOT Workweek Hours (AWH_j): average each of the hourly count intervals, then multiply each result by the **Axle Factor**.

- Note that NYSDOT applies even, whole number rounding procedures to answers. Even, whole number rounding, rounds an answer with a tenth's decimal place of 5 to the nearest even whole number. For all tenth's decimal places other than 5, use common rounding procedures. In the event of a tenth's decimal place of 5, refer to the steps in parts a and b, below.

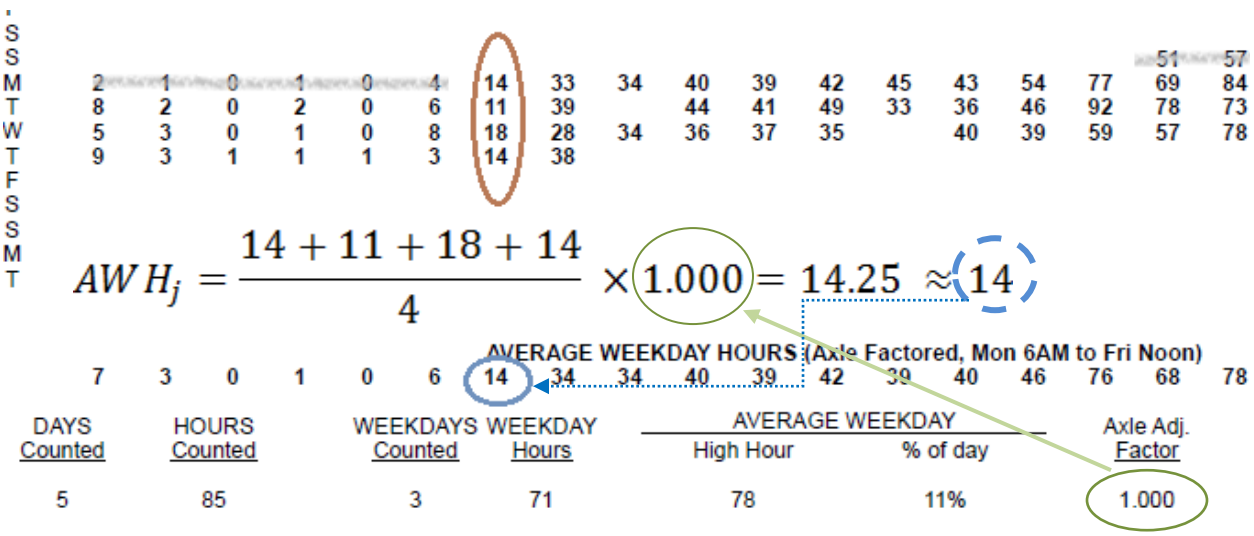
    a. **If *A* = *N*.5, where *N* is an even whole number, *A* is rounded down to the nearest even whole number** (If *N* is an odd whole number, skip this step and refer to part b instead)**.**
        i. **Example:** *A* = 20.5
            1. Since *N* = 20 is an even number, 20.5 will be rounded down to the nearest even whole number of 20.
            2. The answer is *A* = 20.

    b. **If *A* = *N*.5, where *N* is an odd whole number, *A* is rounded up to the nearest even whole number.**
        i. **Example:** *A* = 113.5
            1. Since *N* = 113 is an odd number, 113.5 will be rounded up to the nearest even whole number of 114.
            2. The answer is *A* = 114.

E.g. 4


12 TO 1
1 TO 2
2 TO 3
3 TO 4
4 TO 5
5 TO 6
6 TO 7
7 TO 8
8 TO 9
9 TO 10
10 TO 11
11 TO 12
12 TO 1
1 TO 2
2 TO 3
3 TO 4
4 TO 5
5 TO 6
6 TO 7
7 TO 8
8 TO 9
9 TO 10
DAY
AM
PM
Average all values when possible
If value(s) missing, just average whatever values are available
Average these 3 as anything before 6AM Monday is not used
AVERAGE WEEKDAY HOURS (Axle Factored, Mon 6AM to Fri Noon)
7 3 0 1 0 6 14 34 34 40 39 42 39 40 46 76 68 78 52 28 22 19

E.g. 4.1


$AWH_j = \frac{14 + 11 + 18 + 14}{4} \times 1.000 = 14.25 \approx 14$
AVERAGE WEEKDAY HOURS (Axle Factored, Mon 6AM to Fri Noon)
7 3 0 1 0 6 14 34 34 40 39 42 39 40 46 76 68 78
DAYS Counted
HOURS Counted
WEEKDAYS Counted
WEEKDAY Hours
AVERAGE WEEKDAY
High Hour
% of day
Axle Adj. Factor
5
85
3
71
78
11%
1.000

E.g. 4.2

$$AWH_j = \frac{104 + 86 + 75}{3} \times 0.953 = 84.18 \approx 84$$

F											135	111	102	111	138	122	141	116
S	2	6	2	7	13	29	104	199	171	109	121	112	102	105	148	129	103	92
S	5	0	9	4	11	30	86	192	138	94	151	108	114	117	133	130	149	117
M	8	6	3	8	9	28	75	209	160									
T																		
W																		
T																		
F																		
S																		

AVERAGE WEEKDAY HOURS (Axle Factored, Mon 6AM to Fri Noon)

5	4	5	6	10	28	84	191	149	97	130	105	101	106	133	121	125	103

DAYS Counted	HOURS Counted	WEEKDAYS Counted	WEEKDAY Hours	AVERAGE WEEKDAY High Hour	AVERAGE WEEKDAY % of day	Axle Adj. Factor
4	71	4	71	191	11%	0.953

Step 5: Calculating the ADT

- Sum each of the Average NYSDOT Workweek Hours.

$$ADT = \sum_{j=1}^{24} AWH_j$$

E.g. 5

AVERAGE WEEKDAY HOURS (Axle Factored, Mon 6AM to Fri Noon)

																							ADT
3	2	1	3	9	34	58	61	52	36	39	35	40	45	39	61	46	41	38	20	23	18	15	1	720

...YS ...inted	HOURS Counted	WEEKDAYS Counted	WEEKDAY Hours	AVERAGE WEEKDAY High Hour	AVERAGE WEEKDAY % of day	Axle Adj. Factor	Seasonal/Weekday Adjustment Factor	ESTIMAT

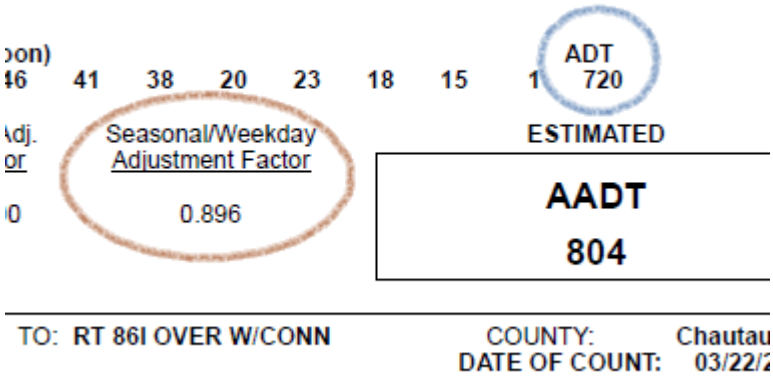
$$ADT = 3 + 2 + 1 + \cdots + 18 + 15 + 1 = 720$$

Step 6: Calculating the AADT

$$AADT = \frac{ADT}{Seasonal\ Adj.Factor} = \frac{ADT}{R_{Seasonal}}$$

- Divide the ADT by the Seasonal/Weekday Adjustment Factor.

E.g. 6



$$AADT = \frac{720}{0.896} = 803.57 \approx 804$$

Step 7: Calculating the Roadway/Final AADT

- Look under the Report Heading to determine if the count was taken by direction or if the count was taken in both directions.
    - If the count was taken with combined directions the Roadway AADT is the value calculated in step 6.

Fig. 7

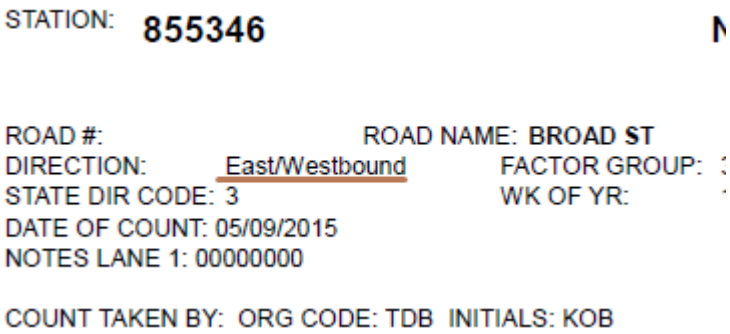
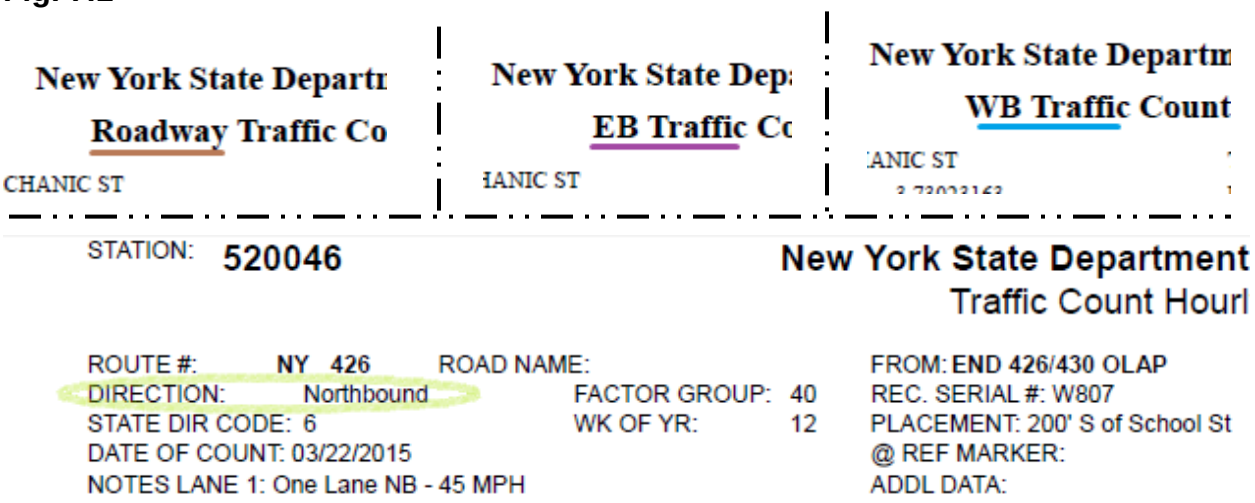


Fig. 7.1



- If the roadway count is directional, sum the two directional AADT's to get the Roadway AADT.

$$AADT = AADT_{Direction1} + AADT_{Direction2}$$

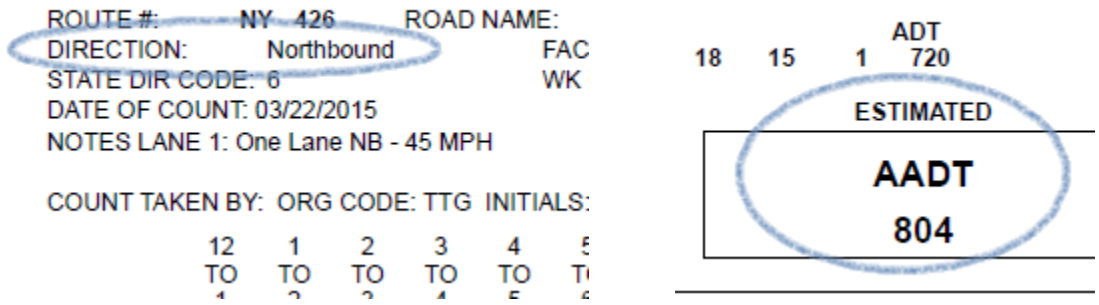
E.g. 7

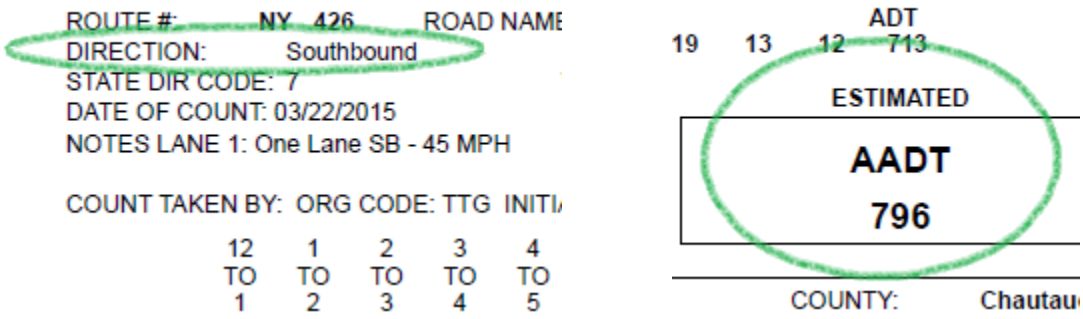
ESTIMATED AADT		
Roadway	East	West
2180	1072	1108

$$AADT = AADT_{East} + AADT_{West}$$

$$AADT = 2180 = 1072 + 1108$$

E.g. 7.1





$$AADT = AADT_{\text{Northbound}} + AADT_{Southbound}$$

AADT = 804 + 796
AADT = 1600

Rqmt. No.	Requirement Description – **Volume Calculations for Short Counts**
RC1	Describe how your proposed system would provide Volume Calculations for Short Counts.
RC1 - Proposer's Response:	

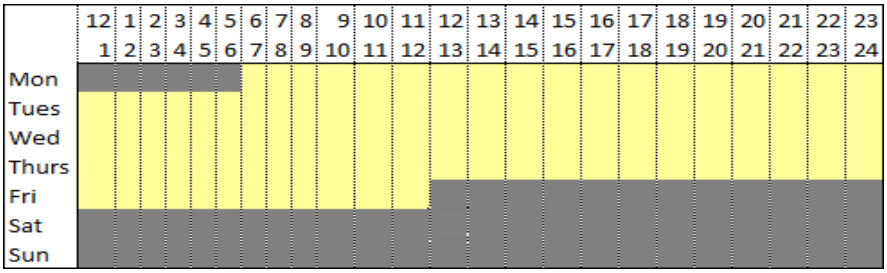
Part 2: Class Calculations for Short Counts

The average weekday calculation is performed following the same steps for all binned data. The sample described uses 13-Bin Vehicle Classification data. When using 6-Bin Vehicle Classification or 15-Bin Speed data follow the same steps for the appropriate number of bins. ***Note: Steps W1 – W4 are calculated for each direction.***

Step W1: Calculate Volumes by Class Bin

- The first step in determining the axle factor is to calculate the average NYSDOT Workweek volumes by vehicle class bin. The NYSDOT Traffic Monitoring Section defines the NYSDOT Workweek period as starting Monday at 6:00 AM and ending Friday at 12:00 Noon.

Fig. W1



E.g. W1

DATE	DAY	12 TO 1	1 TO 2	2 TO 3	3 TO 4	4 TO 5	5 TO 6	6 TO 7	7 TO 8	8 TO 9	9 TO 10	10 TO 11	11 TO 12	12 TO 1	1 TO 2	2 TO 3	3 TO 4	4 TO 5	5 TO 6	6 TO 7	7 TO 8	8 TO 9	9 TO 10	10 TO 11	11 TO 12
		AM												PM											
1	T																								
2	F																								
3	S																								
4	S																								
5	M																								
6	T																								
7	W																								
8	T																								
9	F																								
10	S																								
11	S																								
12	M																570	582	655	472	326	269	174	103	73
13	T	37	21	15	20	36	101	221	452	536	428	430	453	506	550	516	562	573	665	525	403	294	185	105	61
14	W	36	22	11	20	40	110	223	430	539	384	375	411	495	563	564	574	644	706	521	428	295	173	97	68
15	T	44	18	16	22	38	109	212	431	556	365	379	458	582	496	575	534	593	621	501	368	281	209	106	75
16	F	38	19	13	18	41	81	231	479	575	440	479	538	547	545	667	717	575	674	528	429	350	290	147	111
17	S	63	44	22	16	20	39	103	197	250	330	479	554	600	546	519	604	436	405	399	349	247	211	133	74
18	S	52	35	16	15	16	35	73	102	130	227	332	414	539	598	549	519	445	360	277	235	179	157	50	60
19	M	26	10	8	9	29	99	198	426	500	418	386	452	499											
20	T																								
21	W																								

- Remember that data outside the defined NYSDOT Workweek period is **not** used for short counts.

Step W2: Determine Interval

- The data is typically collected and loaded in either 15-minute or hourly intervals by vehicle bin.

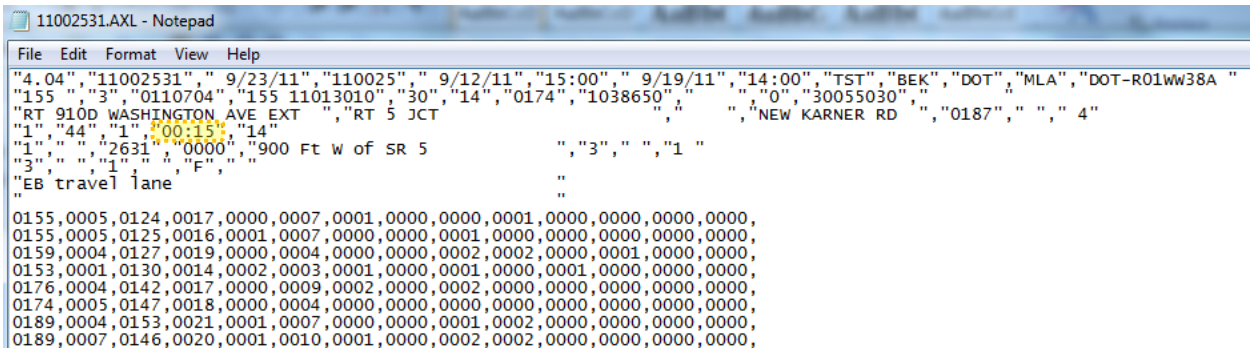
Fig. W2
Data Storing Scheme

Interval
Total

	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11	F12	F13
0124	0004	0090	0012	0005	0007	0001	0000	0000	0000	0001	0000	0000	0000
0147	0008	0112	0009	0004	0004	0003	0000	0000	0001	0000	0000	0000	0000

- Determine if the count is done by 15 or 60-minute intervals.

Fig. W2.1



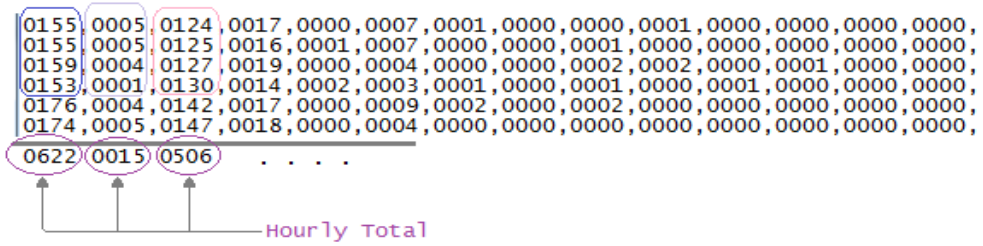
- If the data appears in 15-minute intervals, it must be summed to an hourly interval.

$$INT_{hr} = \sum_{1}^{4} (INT_q)$$

INT_{hr} = hourly count

INT_q = Count for the 15-minute interval

E.g. W2



Step W3: Class Bin Averages

- Each class bin is averaged for each interval of the day.

$$\text{AVG}_{vc_h} = \frac{1}{x}\sum_{1}^{x}(vc_h)$$

x = number of days in sample

vc = vehicle count for the hour

h = hourly interval

E.g. W3

- Raw Data

Tues

09:00	0127	0005	0101	0012	0002	0005	0001	0000	0000	0001	0000	0000	0000	0000
10:00	0147	0004	0122	0013	0003	0004	0001	0000	0000	0000	0000	0000	0000	0000
11:00	0139	0002	0106	0015	0000	0012	0002	0000	0000	0002	0000	0000	0000	0000
12:00	0121	0000	0099	0009	0004	0008	0001	0000	0000	0000	0000	0000	0000	0000
13:00	0133	0001	0110	0010	0001	0010	0000	0000	0000	0001	0000	0000	0000	0000
14:00	0142	0003	0114	0011	0002	0011	0000	0001	0000	0000	0000	0000	0000	0000
15:00	0125	0004	0103	0009	0002	0007	0000	0000	0000	0000	0000	0000	0000	0000

Wed

0123	0003	0099	0012	0002	0007	0000	0000	0000	0000	0000	0000	0000	0000
0159	0005	0128	0014	0004	0004	0003	0000	0000	0001	0000	0000	0000	0000
0144	0000	0122	0005	0000	0013	0002	0000	0000	0002	0000	0000	0000	0000
0154	0004	0126	0009	0001	0011	0001	0000	0000	0002	0000	0000	0000	0000
0111	0000	0096	0006	0000	0007	0000	0000	0001	0001	0000	0000	0000	0000
0117	0003	0095	0007	0000	0010	0001	0001	0000	0000	0000	0000	0000	0000
0121	0003	0098	0010	0002	0008	0000	0000	0000	0000	0000	0000	0000	0000

Thurs

0133	0003	0113	0013	0000	0004	0000	0000	0000	0000	0000	0000	0000	0000
0129	0004	0100	0009	0002	0013	0000	0000	0000	0001	0000	0000	0000	0000
0135	0003	0112	0012	0001	0005	0001	0000	0000	0001	0000	0000	0000	0000
0155	0001	0124	0014	0004	0010	0001	0000	0000	0001	0000	0000	0000	0000
0149	0001	0123	0013	0000	0008	0002	0001	0000	0001	0000	0000	0000	0000
0121	0001	0101	0009	0003	0005	0001	0000	0000	0001	0000	0000	0000	0000
0144	0000	0122	0009	0001	0011	0000	0000	0000	0001	0000	0000	0000	0000

$$\text{AVG}_{F3_{11}} = \frac{1}{3}(15 + 5 + 12) = 11$$

$$\text{AVG}_{F5_{13}} = \frac{1}{3}(10 + 7 + 8) = 8$$

$$\text{AVG}_{F2_{09}} = \frac{1}{3}(101 + 99 + 113) = 104$$

E.g. W3.1

- Averaged Values

VEHICLE CLASS	1	2	3	4	5	6	7	8	9	10	11	12	13
HOUR													
09:00	4	104	12	1	5	0	0	0	0	0	0	0	0
10:00	4	117	12	3	7	1	0	0	1	0	0	0	0
11:00	2	113	11	0	10	2	0	0	2	0	0	0	0
12:00	2	116	11	3	10	1	0	0	1	0	0	0	0
13:00	1	110	10	0	8	1	0	0	1	0	0	0	0
14:00	2	103	9	2	9	1	1	0	0	0	0	0	0
15:00	2	108	9	2	9	0	0	0	0	0	0	0	0

Step W4: Determine Daily Volumes

- The volumes are then summed to get the daily volume for each vehicle classification.

$$F_T = \sum_{i=1}^{24}(F_i)$$

F_T = Total vehicles per a certain class F

F_i = Vehicle count for a certain class F, per hourly interval i.

i = hourly interval

Fig. W4

VEHICLE CLASS		F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11	F12	F13
NO. OF AXLES		2	2	2	2.5	2	3	4	3.5	5	6	5	6	8.75
ENDING HOUR	1:00	0	34	6	0	1	0	0	3	1	0	0	0	0
	2:00	0	18	3	0	0	0	0	6	2	0	1	0	0
	3:00	0	15	4	1	1	0	0	5	3	0	0	0	0
	4:00	0	15	4	0	0	1	0	2	3	0	0	0	0
	5:00	0	30	4	0	0	1	0	1	1	0	0	0	0
	6:00	1	61	15	0	1	2	0	4	2	0	0	0	0
	7:00	6	180	32	2	9	2	0	2	2	0	0	0	0
	8:00	11	485	70	6	20	6	1	8	5	0	0	0	0
	9:00	16	502	83	6	26	5	0	8	5	0	0	0	0
	10:00	11	379	79	6	26	4	0	9	6	1	0	0	0
DIRECTION	11:00	9	402	77	9	23	5	0	11	5	0	0	0	0
East	12:00	11	455	80	5	26	4	0	7	7	0	0	0	0
	13:00	16	506	86	4	23	4	0	5	3	0	0	0	0
	14:00	17	510	84	5	27	4	1	6	4	0	1	0	0
	15:00	18	512	90	5	30	5	0	4	3	0	0	0	0
	16:00	16	516	80	3	21	2	0	4	3	0	0	0	0
	17:00	22	569	73	3	20	4	0	6	4	0	1	0	0
	18:00	22	571	71	2	17	4	0	6	2	0	0	0	0
	19:00	14	459	65	2	17	3	0	5	3	0	0	0	0
	20:00	10	382	50	2	13	2	0	2	2	0	0	0	0
	21:00	4	262	26	1	5	1	0	2	0	0	2	0	0
	22:00	4	180	16	0	5	0	0	3	2	0	1	0	0
	23:00	2	114	10	0	2	0	0	2	0	0	0	0	0
	24:00	2	91	10	0	2	0	0	2	2	0	0	0	0
TOTAL VEHICLES		212	7248	1118	62	315	59	2	113	70	1	6	0	0

E.g. W4

VEHICLE CLASS		F1	F2	F3	F4	F5	F6	F7	F
NO. OF AXLES		2	2	2	2.5	2	3	4	3
ENDING HOUR	1:00	0	34	6	0	1	0	0	
	2:00	0	18	3	0	0	0	0	
	3:00	0	15	4	1	1	0	0	
	4:00	0	15	4	0	0	1	0	
	5:00	0	30	4	0	0	1	0	
	6:00	1	61	15	0	1	2	0	
	7:00	6	180	32	2	9	2	0	
	8:00	11	485	70	6	20	6	1	
	9:00	16	502	83	6	26	5	0	
	10:00	11	379	79	6	26	4	0	
DIRECTION	11:00	9	402	77	9	23	5	0	1
East	12:00	11	455	80	5	26	4	0	
	13:00	16	506	86	4	23	4	0	
	14:00	17	510	84	5	27	4	1	
	15:00	18	512	90	5	30	5	0	
	16:00	16	516	80	3	21	2	0	
	17:00	22	569	73	3	20	4	0	
	18:00	22	571	71	2	17	4	0	
	19:00	14	459	65	2	17	3	0	
	20:00	10	382	50	2	13	2	0	
	21:00	4	262	26	1	5	1	0	
	22:00	4	180	16	0	5	0	0	
	23:00	2	114	10	0	2	0	0	
	24:00	2	91	10	0	2	0	0	
TOTAL VEHICLES		212	7248	1118	62	315	59	2	1
TOTAL AXLES		424	14496	2236	155	630	177	8	3

$$F3_{tot} = 6 + 3 + 4 + 4 + 4 + 15 + 32 + 70 + 83 + 79 + 77 + 80 + 86 + 84 + 90 + 80 + 73 + 71 + 65 + 50 + 26 + 16 + 10 + 10$$

$$F3_{tot} = 1118$$

$$F6_{tot} = 0 + 0 + 0 + 1 + 1 + 2 + 2 + 6 + 5 + 4 + 5 + 4 + 4 + 4 + 5 + 2 + 4 + 4 + 3 + 2 + 1 + 0 + 0 + 0$$

$$F6_{tot} = 59$$

Step W5: Determine Average NYSDOT Workweek Volumes

- Finally, the directional volumes are added to get the average NYSDOT Workweek volumes for each vehicle class.

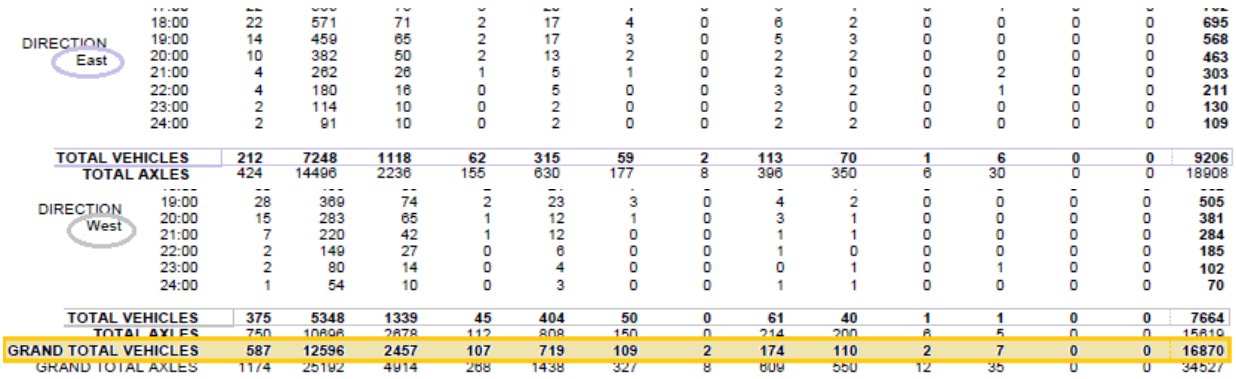
$$N_{vc_{dT}} = N_{vc_{dir1}} + N_{vc_{dir2}}$$

vc = vehicle class

dT = daily total

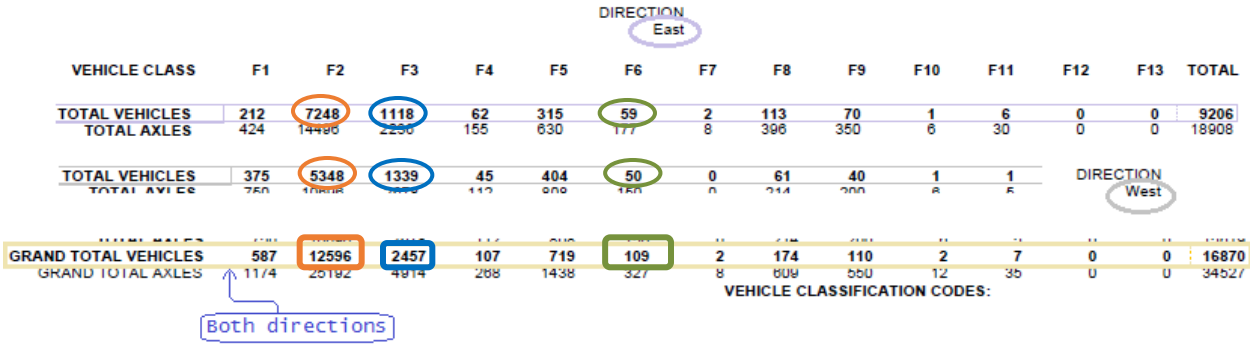
N = number of vehicles

Fig. W5



DIRECTION														
East	18:00	22	571	71	2	17	4	0	6	2	0	0	0	0	695
	19:00	14	459	65	2	17	3	0	5	3	0	0	0	0	568
	20:00	10	382	50	2	13	2	0	2	2	0	0	0	0	463
	21:00	4	262	26	1	5	1	0	2	0	0	2	0	0	303
	22:00	4	180	16	0	5	0	0	3	2	0	1	0	0	211
	23:00	2	114	10	0	2	0	0	2	0	0	0	0	0	130
	24:00	2	91	10	0	2	0	0	2	2	0	0	0	0	109
TOTAL VEHICLES		212	7248	1118	62	315	59	2	113	70	1	6	0	0	9206
TOTAL AXLES		424	14496	2236	155	630	177	8	396	350	6	30	0	0	18908
DIRECTION															
West	19:00	28	369	74	2	23	3	0	4	2	0	0	0	0	505
	20:00	15	283	65	1	12	1	0	3	1	0	0	0	0	381
	21:00	7	220	42	1	12	0	0	1	1	0	0	0	0	284
	22:00	2	149	27	0	6	0	0	1	0	0	0	0	0	185
	23:00	2	80	14	0	4	0	0	0	1	0	1	0	0	102
	24:00	1	54	10	0	3	0	0	1	1	0	0	0	0	70
TOTAL VEHICLES		375	5348	1339	45	404	50	0	61	40	1	1	0	0	7664
TOTAL AXLES		750	10696	2678	112	808	150	0	214	200	6	5	0	0	15619
GRAND TOTAL VEHICLES		587	12596	2457	107	719	109	2	174	110	2	7	0	0	16870
GRAND TOTAL AXLES		1174	25192	4914	268	1438	327	8	609	550	12	35	0	0	34527

E.g. W5



***F2*dt:**

$$N_{F2_{dT}} = N_{F2_{dir1}} + N_{F2_{dir2}}$$

$$N_{F2_{dT}} = 7248 + 5348 = \boxed{12596}$$

***F3*dt:**

$$N_{F3_{dT}} = N_{F3_{dir1}} + N_{F3_{dir2}}$$

$$N_{F3_{dT}} = 1118 + 1339 = \boxed{2457}$$

***F6*dt:**

$$N_{F6_{dT}} = N_{F6_{dir1}} + N_{F6_{dir2}}$$

$$N_{F6_{dT}} = 59 + 50 = \boxed{109}$$

E.g. W5.1

MONTH: September

110025

DIRECTION	East	West	TOTAL
NUMBER OF VEHICLES	9206	7664	16870
NUMBER OF AXLES	18908	15619	34527
% HEAVY VEHICLES (F4-F13)	6.82%	7.85%	7.29%
% TRUCKS AND BUSES (F3-F13)	18.97%	25.33%	21.86%
AXLE CORRECTION FACTOR	0.97	0.98	0.98

$$AVG_{NYW} = Total_{Dir1} + Total_{Dir2}$$

$$AVG_{NYW} = 9206 + 7664$$

$$AVG_{NYW} = 16870$$

Rqmt. No.	Requirement Description – **Class Calculations for Short Counts**
RC2	Describe how your proposed system would provide Class Calculations for Short Counts.
RC2 - Proposer's Response:	

Part 3: Axle Factor Calculations

NYSDOT requires axle factors to be based on Continuous Count data and Short Count data for multiple years. If the proposed system **does not** accommodate this already, the following Axle Factor calculation below will be required.

Many volume counts use a single air-switch to measure the volume of traffic for a certain location. A single air-switch is only capable of detecting axles. Nearly all cars have two axles, however heavy vehicle classes have a widely varying number of axles. When calculating the AADT, we use the Axle Factor to compensate for these additional axles. By using classification counts taken at continuous and short count sites, it is possible to calculate an Axle Adjustment Factor. NYSDOT produces axle adjustment factors grouped by roadway, functional class and region to account for the variation of vehicles on different roadways.

Axle factors are calculated from all vehicle classification counts (from both short count and continuous count data collection) collected over the prior 6 years. In the calculation of the axle factors, the average NYSDOT Workweek volumes by vehicle class bin are used. Final axle factors are stratified by NYSDOT region and roadway functional classification.

$$F_{axle} = Total\ Vehicles\left(\frac{2}{Total\ Axles}\right)$$

Step 1: Calculate Total Axles

Fig. 1

- NYSDOT Scheme for Number of Axles per Vehicle Class

VEHICLE CLASS	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11	F12	F13	TOTAL
NO. OF AXLES	2	2	2	2.5	2	3	4	3.5	5	6	5	6	8.75	

E.g. 1

vehi_class	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11	F12	F13
# axles	2	2	2	2.5	2	3	4	3.5	5	6	5	6	8.75
.. .. ..													
total_vehi	8	164	45	10	5	3	1	2	7	1	1	0	0
grand total axles	16	328	90	25	10	9	4	7	35	6	5	0	0

- For each roadway count, class bin totals are multiplied by the **number of axles** for each class bin to get the total axles.

Step 2: Calculate an Axle Factor for a Single Station

- Apply the Axle Factor formula.

E.g. 2

DIRECTION	North	South	TOTAL
NUMBER OF VEHICLES	4031	3922	7953
NUMBER OF AXLES	8418	8197	16615
% HEAVY VEHICLES (F4-F13)	8.40%	8.10%	8.20%
% TRUCKS & BUSES (F3-F13)	27.80%	27.70%	27.70%
AXLE CORRECTION FACTOR	0.96	0.96	0.96

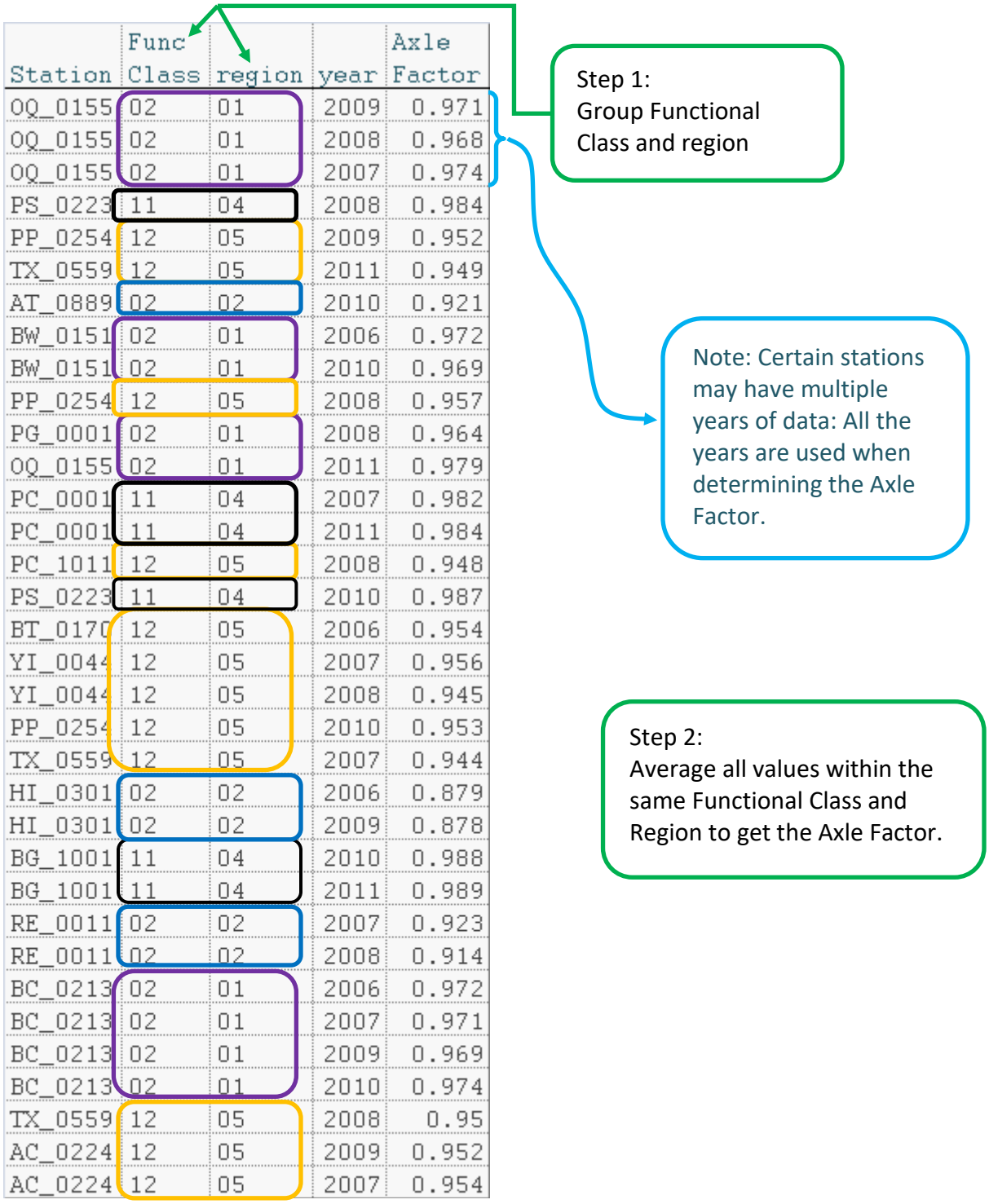
$$F_{axle} = Total\ Vehicles\left(\frac{2}{Total\ Axles}\right)$$

$$F_{axle} = (7953) * \frac{2}{16615}$$

$$F_{axle} = 0.957$$

Calculating Axle Factors for Region & Functional Class

1. Data from the prior six years is used to estimate Axle Adjustment Factors for 2012 (2011, 2010, 2009, 2008, 2007, 2006).



Station	Func Class	region	year	Axle Factor
OQ_0155	02	01	2009	0.971
OQ_0155	02	01	2008	0.968
OQ_0155	02	01	2007	0.974
PS_0223	11	04	2008	0.984
PP_0254	12	05	2009	0.952
TX_0559	12	05	2011	0.949
AT_0889	02	02	2010	0.921
BW_0151	02	01	2006	0.972
BW_0151	02	01	2010	0.969
PP_0254	12	05	2008	0.957
PG_0001	02	01	2008	0.964
OQ_0155	02	01	2011	0.979
PC_0001	11	04	2007	0.982
PC_0001	11	04	2011	0.984
PC_1011	12	05	2008	0.948
PS_0223	11	04	2010	0.987
BT_017(	12	05	2006	0.954
YI_0044	12	05	2007	0.956
YI_0044	12	05	2008	0.945
PP_0254	12	05	2010	0.953
TX_0559	12	05	2007	0.944
HI_0301	02	02	2006	0.879
HI_0301	02	02	2009	0.878
BG_1001	11	04	2010	0.988
BG_1001	11	04	2011	0.989
RE_0011	02	02	2007	0.923
RE_0011	02	02	2008	0.914
BC_0213	02	01	2006	0.972
BC_0213	02	01	2007	0.971
BC_0213	02	01	2009	0.969
BC_0213	02	01	2010	0.974
TX_0559	12	05	2008	0.95
AC_0224	12	05	2009	0.952
AC_0224	12	05	2007	0.954

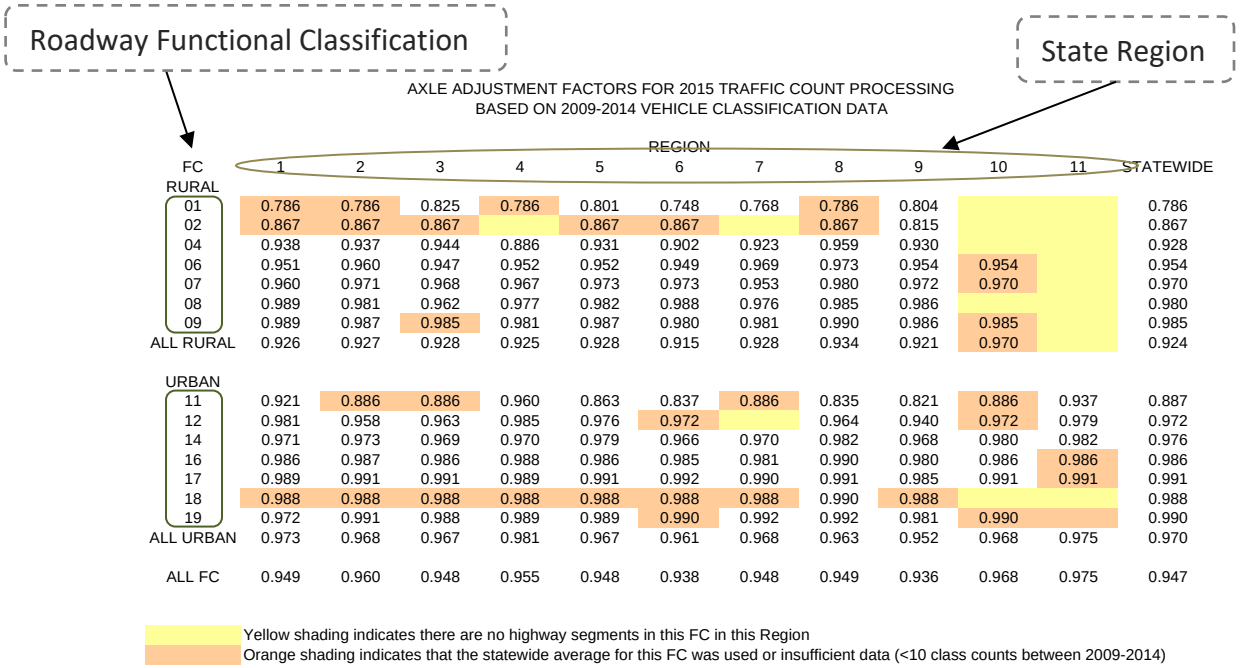
				axle adj. factors 2012					
FC					REGION				
RURAL	1	2	3	4	5	6	7	8	9
01									
02	0.971	0.903							
04									
06									
07									
08									
09									
ALL RURAL									
URBAN									
11				0.986					
12					0.951				
14									
16									
17									

Region 1, Functional Class 02 Calculation

$$F_{axle} = \frac{0.971 + 0.968 + 0.974 + 0.972 + 0.969 + 0.964 + 0.979 + 0.972 + 0.971 + 0.969 + 0.974}{11}$$

$$F_{axle} = 0.971$$

Fig. 2
Final Calculated Values for Region and Roadway Functional Class



FC	1	2	3	4	5	6	7	8	9	10	11	STATEWIDE
RURAL												
01	0.786	0.786	0.825	0.786	0.801	0.748	0.768	0.786	0.804			0.786
02	0.867	0.867	0.867		0.867	0.867		0.867	0.815			0.867
04	0.938	0.937	0.944	0.886	0.931	0.902	0.923	0.959	0.930			0.928
06	0.951	0.960	0.947	0.952	0.952	0.949	0.969	0.973	0.954	0.954		0.954
07	0.960	0.971	0.968	0.967	0.973	0.973	0.953	0.980	0.972	0.970		0.970
08	0.989	0.981	0.962	0.977	0.982	0.988	0.976	0.985	0.986			0.980
09	0.989	0.987	0.985	0.981	0.987	0.980	0.981	0.990	0.986	0.985		0.985
ALL RURAL	0.926	0.927	0.928	0.925	0.928	0.915	0.928	0.934	0.921	0.970		0.924
URBAN												
11	0.921	0.886	0.886	0.960	0.863	0.837	0.886	0.835	0.821	0.886	0.937	0.887
12	0.981	0.958	0.963	0.985	0.976	0.972		0.964	0.940	0.972	0.979	0.972
14	0.971	0.973	0.969	0.970	0.979	0.966	0.970	0.982	0.968	0.980	0.982	0.976
16	0.986	0.987	0.986	0.988	0.986	0.985	0.981	0.990	0.980	0.986	0.986	0.986
17	0.989	0.991	0.991	0.989	0.991	0.992	0.990	0.991	0.985	0.991	0.991	0.991
18	0.988	0.988	0.988	0.988	0.988	0.988	0.988	0.990	0.988			0.988
19	0.972	0.991	0.988	0.989	0.989	0.990	0.992	0.992	0.981	0.990		0.990
ALL URBAN	0.973	0.968	0.967	0.981	0.967	0.961	0.968	0.963	0.952	0.968	0.975	0.970
ALL FC	0.949	0.960	0.948	0.955	0.948	0.938	0.948	0.949	0.936	0.968	0.975	0.947

Yellow shading indicates there are no highway segments in this FC in this Region
Orange shading indicates that the statewide average for this FC was used or insufficient data (<10 class counts between 2009-2014)

Rqmt. No.	Requirement Description – **Axle Factor Calculations**
RC3	Describe how your proposed system would provide Axle Factor Calculations.
RC3 - Proposer's Response:	

Part 4: Continuous Count Calculations

NYSDOT will only accept the two possible calculation methods for continuous counts listed below. ***Note that the AASHTO method listed in the TMG is not an acceptable calculation method.*** The only acceptable calculation methods are either:

1. The Jessberger Battelle Method
2. The NYSDOT AADT Continuous Count Method described below

NYSDOT AADT Continuous Count Method

Background Information

Continuous Count Sites are intended to collect data 24 hours a day, 365 days a year. As these permanent sites are more costly than short counts and require additional maintenance, there are significantly less of these compared to short count locations. The level of data collected at each continuous site is dependent on the equipment installed and varies by location. Though continuous count sites are intended to get data 24/7, realistically this rarely happens. To account for this, the NYSDOT AADT formula is intended to function with minor gaps in the data.

NYSDOT Continuous Count AADT Formula

$$AADT = \sum_{h=1}^{24} \left\{ \frac{1}{7} \sum_{i=1}^{7} \left[\frac{1}{12} \sum_{j=1}^{12} \left(\frac{1}{n} \sum_{k=1}^{n} VOL_{hijk} \right) \right] \right\}$$

VOL = daily traffic for hour h, of day k, of DOW i, and month j

h = hour of day

i = day of the week

j = month of the year

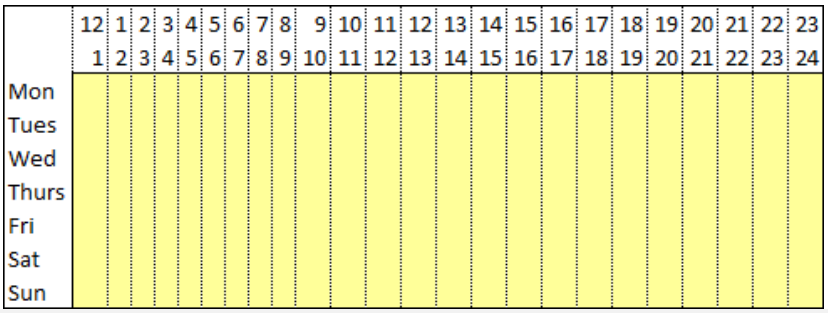
k = each occurrence of that day of the week in a month

n = the number of days of that day of the week during that month (usually between one and five, depending on the number of missing data)

- These calculations assume data is arranged in hourly intervals by direction.

- When calculating the AADT at continuous sites, data from the entire week is used, including weekends and holidays. This is in contrast to short count sites where only data from 6:00 AM Monday – 12:00 Noon Friday is used

Fig. 1



Data Analysis

- Raw traffic data is collected for each of the 12 months. Once all the data is collected, the values can then be analyzed.

Step 1: Begin to Average Data

- Data is averaged by each hourly interval for each day of the week.

$$\mathrm{AVG}_{hij} = \frac{1}{\mathrm{n}} \sum_{k=1}^{n} VOL_{hijk}$$

E.g. 1

JAN		Interval																							
	1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
R	1	0	2	1	0	4	13	30	75	64	48	47	42	53	46	44	48	57	54	41	39	22	15	12	8
F	2	5	2	3	6	3	14	43	58	67	40	35	39	49	39	42	51	65	70	53	36	23	17	12	9
S	3	7	4	8	5	1	9	10	17	28	22	32	44	39	72	47	60	57	32	43	42	28	34	43	49
U	4	8	0	4	3	9	8	6	24	18	34	38	32	64	37	60	32	52	36	22	25	20	18	12	4
M	5	0	0	3	3	6	18	40	56	55	38	38	42	43	39	37	50	61	70	44	26	36	22	19	14
T	6	2	0	2	5	7	12	25	40	49	40	48	35	44	37	40	41	65	50	53	25	21	19	17	7
W	7	0	3	4	9	11	21	37	68	58	39	37	43	40	36	46	44	53	56	45	43	26	17	17	5
R	8	1	3	1	2	5	19	31	69	58	43	34	45	45	31	51	49	77	73	50	34	29	10	18	0
F	9	4	5	0	1	3	18	39	41	60	37	39	50	42	48	50	55	51	65	49	42	20	24	12	5
S	10	10	10	0	9	3	10	13	7	19	34	31	46	36	58	38	49	60	39	32	51	39	37	48	37
U	11	13	11	5	2	9	6	12	21	25	17	41	30	60	75	64	52	55	36	24	34	22	27	19	11
M	12	0	2	0	0	7	21	36	44	45	44	47	46	42	39	52	48	67	69	59	21	36	18	16	0
T	13	2	3	4	4	2	15	34	40	50	51	41	44	38	47	44	52	58	70	56	31	28	23	13	4
W	14	1	3	7	2	4	21	29	75	68	36	46	30	40	37	45	58	59	78	45	28	26	9	15	11
R	15	2	5	0	2	5	10	31	66	63	47	37	49	53	42	53	46	78	76	41	45	19	24	12	4
F	16	0	2	4	4	2	12	33	69	68	47	49	35	32	41	40	47	52	78	58	26	36	25	6	1
S	17	15	10	1	4	5	8	11	13	15	32	45	64	41	50	32	45	57	45	31	65	56	35	24	20
U	18	18	7	4	1	7	9	5	16	13	41	36	62	46	48	35	65	46	48	31	21	32	26	15	17
M	19	4	2	3	5	10	20	27	54	53	48	33	50	34	45	52	53	64	60	56	29	33	12	7	10
T	20	0	3	6	6	4	15	29	73	57	47	34	48	51	47	36	39	65	61	47	25	19	19	15	2
W	21	5	0	2	5	8	12	26	79	57	44	42	37	34	31	37	40	79	70	46	27	35	12	18	13
R	22	3	4	0	4	4	10	29	41	56	42	37	44	41	34	49	55	72	64	58	31	30	18	8	9
F	23	2	3	3	1	10	11	27	57	54	36	30	39	36	46	50	49	53	75	60	43	22	14	9	3
S	24	12	4	7	2	9	0	6	12	25	22	39	49	43	32	68	33	53	26	37	37	66	33	32	22
U	25	16	6	1	8	3	6	8	21	25	33	43	50	49	41	32	35	43	44	24	25	24	20	18	13
M	26	2	1	7	4	3	14	28	57	58	51	34	45	38	43	53	48	75	78	57	24	21	14	18	7
T	27	3	0	0	5	8	15	39	42	63	36	34	50	48	34	55	40	63	74	48	40	37	16	7	3
W	28	4	5	7	0	5	10	34	63	57	41	49	35	40	43	53	46	70	80	56	33	36	15	15	5
R	29	1	1	2	8	8	11	26	52	55	35	31	43	45	43	36	59	76	68	43	41	39	21	17	3
F	30	1	1	4	1	2	17	34	59	65	46	43	34	44	40	55	51	75	78	42	44	17	22	18	8
S	31	15	5	8	7	6	2	4	10	31	34	39	38	67	44	68	55	44	29	58	55	60	34	37	27
M	avg	2	1	3	3	6	18	33	53	53	45	38	46	39	42	48	50	67	69	54	25	32	16	15	8
T	avg	2	2	3	5	5	14	32	49	55	44	39	44	45	41	44	43	63	64	51	30	26	19	13	4
W	avg	2	3	5	4	7	16	32	71	60	40	44	36	38	37	45	47	65	71	48	33	31	13	16	8
R	avg	1	3	1	3	5	13	29	61	59	43	37	45	47	39	47	51	72	67	47	38	28	18	13	5
F	avg	2	3	3	3	4	14	35	57	63	41	39	39	41	43	47	51	59	73	52	38	24	20	11	5
S	avg	12	7	5	5	5	6	9	12	24	29	37	48	45	51	51	48	54	34	40	50	50	35	37	31
U	avg	14	6	4	4	7	7	8	20	20	31	40	44	55	50	48	46	49	41	25	26	24	23	16	11

$$AVG_{int2\_Wed\_JAN} = \frac{1}{4}(3+3+0+5) = 3$$

$$AVG_{int4\_Mon\_JAN} = \frac{1}{4}(3+0+5+4) = 3$$

$$AVG_{int11\_Fri\_JAN} = \frac{1}{5}(35+39+49+30+43) = 39$$

$$AVG_{int20\_Sun\_JAN} = \frac{1}{4}(25+34+21+25) = 26$$

Step 2: Determine Averages for Each Month

- Repeat Step 1 for each month to determine the hourly interval averages by day for each month.

E.g. 2

FEB		Interval																							
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
M	avg	2	1	1	0	1	8	18	44	52	39	40	42	41	40	42	51	55	68	49	28	32	17	13	4
T	avg	1	1	0	0	4	4	16	49	55	44	37	39	43	35	45	46	67	69	48	28	27	16	12	5
W	avg	3	2	1	1	3	7	17	51	64	41	36	38	38	43	42	44	55	64	51	36	32	17	15	8
R	avg	2	1	1	2	2	7	11	63	61	38	35	44	42	35	40	50	70	74	46	38	28	18	10	9
F	avg	0	2	1	0	2	8	14	47	58	42	39	40	40	44	48	41	62	67	52	34	29	18	12	7
S	avg	1	1	0	0	4	6	8	18	27	30	36	39	58	47	49	48	55	44	37	38	36	34	24	19
U	avg	0	1	2	0	1	5	9	29	22	28	40	42	56	58	50	43	45	39	29	29	27	18	15	9

MAR		Interval																							
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
M	avg	2	1	2	3	3	7	15	64	62	46	40	39	38	39	41	47	63	65	49	31	30	19	13	7
T	avg	1	2	2	2	4	5	19	51	60	42	39	43	40	35	44	47	61	62	48	36	27	12	20	7
W	avg	2	1	2	0	3	8	11	45	51	38	41	41	37	38	45	42	58	62	48	34	33	14	15	6
R	avg	0	1	1	0	2	4	16	60	58	39	41	45	38	39	49	42	51	69	52	29	24	13	12	9
F	avg	0	0	1	1	3	9	18	53	50	40	36	43	40	43	48	44	60	66	50	27	27	16	13	7
S	avg	2	0	2	1	2	1	10	20	27	34	40	53	51	46	51	42	46	42	35	36	25	26	23	20
U	avg	0	0	2	2	0	2	7	24	22	23	39	43	52	55	47	49	42	33	35	32	33	17	18	14

DEC		Interval																							
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
M	avg	1	1	1	2	5	10	25	67	61	45	36	53	44	39	45	42	54	67	56	34	30	32	17	10
T	avg	4	0	0	0	7	12	14	73	57	40	37	50	50	41	47	44	70	59	53	29	31	36	18	9
W	avg	0	0	0	1	7	12	26	68	56	38	41	45	44	39	45	50	61	61	52	35	28	32	14	16
R	avg	0	0	0	0	8	10	17	69	53	40	38	44	50	36	40	44	68	63	63	36	34	31	20	8
F	avg	0	0	0	0	9	17	23	63	64	47	41	38	47	40	49	47	51	68	64	37	37	35	27	24
S	avg	2	0	0	0	4	7	14	28	39	44	48	55	59	58	59	57	47	49	37	34	22	38	29	35
U	avg	1	1	0	1	5	5	10	18	25	27	36	44	56	52	50	49	48	38	32	30	29	22	18	20

Step 3: Determine Daily Averages for the Year

- After calculating averages for each month, data is then averaged by month to get 7 daily annual averages for each hourly interval for the year.

$$\mathrm{AVG}_{hi} = \frac{1}{\mathrm{m}} \sum_{j=1}^{m} VOL_{hij}$$

m = number of months data was calculated for
  - Ideally, this number should be 12 or as close thereto as possible

Fig. 3

YEAR 2015	Interval 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
M avg	2	1	2	2	3	9	18	59	57	41	38	43	40	39	43	47	60	63	51	30	32	28	16	7
T avg	2	1	1	2	5	10	18	60	58	42	38	42	43	40	46	47	63	64	50	32	30	27	16	7
W avg	3	1	1	1	5	10	18	61	56	42	39	41	40	39	44	46	62	65	52	34	31	26	16	8
R avg	2	1	1	1	6	9	18	62	59	41	38	43	43	39	45	46	63	65	53	33	32	26	16	7
F avg	1	1	2	1	6	11	17	62	57	41	38	41	42	39	45	46	60	68	53	34	32	30	20	11
S avg	5	2	2	1	3	6	12	25	33	39	44	47	52	52	52	51	55	48	40	38	33	32	28	23
U avg	3	2	1	1	3	6	10	23	29	33	37	42	52	51	49	49	47	42	36	32	29	23	17	12

E.g. 3

$$\text{AVG}_{int5\_Wed} = \frac{1}{m}\sum_{j=1}^{m} VOL_{int5\_Wed\_j}$$

$$\text{AVG}_{int5\_Wed} = \frac{1}{12}\underbrace{(7 + 3 + 3 + 2 + 6 + 5 + 4 + 7 + 5 + 6 + 6 + 7)}_{\text{JAN} \quad \text{FEB} \quad \cdots \quad \text{NOV} \quad \text{DEC}}$$

$$\text{AVG}_{int5\_Wed} = 5$$

$$\text{AVG}_{int7\_Fri} = \frac{1}{12}(35 + 14 + 18 + 13 + 12 + 13 + 15 + 18 + 18 + 14 + 14 + 23)$$

$$\text{AVG}_{int7\_Fri} = 17$$

$$\text{AVG}_{int20\_Thurs} = \frac{1}{12}(38 + 38 + 29 + 35 + 29 + 33 + 36 + 37 + 34 + 27 + 28 + 36)$$

$$\text{AVG}_{int20\_Thurs} = 33$$

Step 4: Calculate Annual Average for Hourly Interval

- The 7 daily annual averages for each hourly interval are now averaged together to get the average weekend, NYSDOT Workweek and full week by hourly intervals for the year.

$$\text{AVG}_h = \frac{1}{p}\sum_{i=1}^{p} VOL_{hi}$$

p = number of instances day occurs

p will be 7 for full week, between 4 and 5 (depending on hourly interval) for NYSDOT Workweek, and 2 for weekend

Full week: Uses all the data from all days/hours.
NYSDOT Workweek: Uses only the data from Monday 6:00 AM – Friday 12:00 Noon.
Weekend: Uses only the data from Saturday and Sunday.

fw = Full week ***nyw = NYSDOT Workweek*** ***wkd = Weekend***

E.g. 4
Calculations for Yearly Average Full Week Intervals

YEAR 2015		1	2	3	4	5	6	7
M	avg	2	1	2	2	3	9	18
T	avg	2	1	1	2	5	10	18
W	avg	3	1	1	1	5	10	18
R	avg	2	1	1	1	6	9	18
F	avg	1	1	2	1	6	11	17
S	avg	5	2	2	1	3	6	12
U	avg	3	2	1	1	3	6	10

$$\text{AVG\_fw}_{int4} = \frac{1}{7}\sum_{i=1}^{7} VOL_{hi}$$

$$\text{AVG\_fw}_{int4} = \frac{1}{7}(2+1+1+1+2+2+1) = 1$$

$$\text{AVG\_fw}_{int10} = \frac{1}{7}(41+42+42+41+41+39+33) = 40$$

$$\text{AVG\_fw}_{int20} = \frac{1}{7}(30+32+34+33+34+38+32) = 33$$

E.g. 4.1

Calculations for Yearly Average NYSDOT Workweek Intervals

YEAR 2015		1	2	3	4
M	avg	2	1	2	2
T	avg	2	1	1	2
W	avg	3	1	1	1
R	avg	2	1	1	1
F	avg	1	1	2	1
S	avg	5	2	2	1
U	avg	3	2	1	1

$$AVG\_nyw_{int4} = \frac{1}{4}(2 + 1 + 1 + 1) = 1$$

YEAR 2015		Interval 5	6	7	8	9	10	11	12
M	avg	3	9	18	59	57	41	38	43
T	avg	5	10	18	60	58	42	38	42
W	avg	5	10	18	61	56	42	39	41
R	avg	6	9	18	62	59	41	38	43
F	avg	6	11	17	62	57	41	38	41

$$AVG\_nyw_{int10} = \frac{1}{5}(41 + 42 + 42 + 41 + 41) = 41$$

2015		17	18	19	20	21	22
M	avg	60	63	51	30	32	28
T	avg	63	64	50	32	30	27
W	avg	62	65	52	34	31	26
R	avg	63	65	53	33	32	26
F	avg	60	68	53	34	32	30

$$AVG\_nyw_{int20} = \frac{1}{4}(30 + 32 + 34 + 33) = 32$$

E.g. 4.2
Calculation for Average Weekend

YEAR 2015		1	2	3	4	5	Int
M	avg	2	1	2	2	3	
T	avg	2	1	1	2	5	1
W	avg	3	1	1	1	5	1
R	avg	2	1	1	1	6	
F	avg	1	1	2	1	6	1
S	avg	5	2	2	1	3	
U	avg	3	2	1	1	3	

$$\text{AVG\_wkd}_{int4} = \frac{1}{2}\sum_{i=1}^{2} VOL_{hi}$$

$$\text{AVG\_wkd}_{int4} = \frac{1}{2}(1+1) = 1$$

$$\text{AVG\_wkd}_{int10} = \frac{1}{2}(39+33) = 36$$

$$\text{AVG\_wkd}_{int20} = \frac{1}{2}(38+32) = 35$$

E.g. 4.3
Calculation of Yearly Average Interval Figures for Full Week

YEAR 2015	Interval 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
fw avg	3	1	1	1	4	9	16	50	50	40	39	43	45	43	46	47	59	59	48	33	31	27	18	11

- The summation of the Full Week intervals determines the Annual Average Daily Traffic (AADT).

$$\text{AADT} = \sum_{h=1}^{24} VOL_{h_{fw}}$$

AADT = 3 + 1 + 1 + 1 + 4 + 9 + 16 + 50 + 50 + 40 + 39 + 43 + 45 + 43 + 46 + 47 + 59 + 59 + 48 + 33 + 31 + 27 + 18 + 11

AADT = **724**

E.g. 4.4
Calculation of Yearly Average Interval Figures for NYSDOT Workweek

YEAR	Interval																							
2015	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
ww avg	2	1	1	1	6	10	18	61	57	41	38	42	42	39	44	46	62	64	52	32	31	27	16	7

- The summation of the NYSDOT week intervals determines the Annual Average Weekday Traffic (AAWDT).

$$\text{AAWDT} = \sum_{h=1}^{24} VOL_{h_{ww}}$$

AAWDT = 2 + 1 + 1 + 1 + 6 + 10 + 18 + 61 + 57 + 41 + 38 + 42 + 42 + 39 + 44 + 46 + 62 + 64 + 52 + 32 + 31 + 27 + 16 + 7

AAWDT = **740**

E.g. 4.5
Calculation of Yearly Average Interval Figures for Weekend

YEAR	Interval																							
2015	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
wkd avg	4	2	2	1	3	6	11	24	31	36	40	44	52	52	50	50	51	45	38	35	31	28	22	18

- The summation of the Weekend intervals determines the Annual Average Weekend Traffic (AAWET).

$$\text{AAWET} = \sum_{h=1}^{24} VOL_{h_{wkd}}$$

AAWET = 4 + 2 + 2 + 1 + 3 + 6 + 11 + 24 + 31 + 36 + 40 + 44 + 52 + 52 + 50 + 50 + 51 + 45 + 38 + 35 + 31 + 28 + 22 + 18

AAWET = **676**

Rqmt. No.	Requirement Description – **Continuous Count Calculations**
RC4	Describe how your proposed system would provide Continuous Count Calculations.
RC4 - Proposer's Response:	