



**ATTACHMENT E**  
**Signal Warrant Analysis**

**INPUT DATA**

<b>Input data only in green fields</b>
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Major/Minor Information	<input type="text" value="1"/>	1 => N/S is major 2 => E/W is major
Urban/Rural Information	<input type="text" value="1"/>	1 => Urban 2 => Rural
Total Intersection Approaches	<input type="text" value="4"/>	

**Lane configuration**

	No of lanes		Scenario	<input type="text" value="Exist Wed"/>
Major Street	<input type="text" value="1"/>			
Minor Street	<input type="text" value="1"/>			

	<b>Total</b>
<b>Worst Case Delay</b>	<b>Vehicles per</b>
	<b>second</b>
Minor Street	<input type="text" value="23"/>
	<b>Vehicles on</b>
	<b>Approach</b>
	<input type="text" value="316"/>

**Approaching Volume**

Hours	Major Street		Minor Street	
	N.B	S.B	E.B	W.B
12:00 AM	6	13	1	2
1:00 AM	4	7	2	3
2:00 AM	1	2	1	1
3:00 AM	1	4	2	3
4:00 AM	5	5	4	3
5:00 AM	26	22	21	4
6:00 AM	89	62	54	40
7:00 AM	411	251	254	189
8:00 AM	328	333	291	206
9:00 AM	350	238	165	128
10:00 AM	259	252	101	119
11:00 AM	267	307	136	128
12:00 PM	241	344	148	179
1:00 PM	249	324	111	126
2:00 PM	336	382	220	240
3:00 PM	269	381	180	196
4:00 PM	341	485	240	245
5:00 PM	336	527	199	274
6:00 PM	287	551	212	179
7:00 PM	218	327	150	152
8:00 PM	124	228	59	69
9:00 PM	87	240	45	117
10:00 PM	38	78	18	36
11:00 PM	15	19	4	6

### Warrant 1A: Minimum Vehicular Volume

The warrant is satisfied when, for each of any 8 hours of an average day, the traffic volumes given in the table below exist on the major street and on the higher-volume minor street approach to the intersection.

Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)	Vehicles per hour on higher-volume minor-street approach (one direction only)
Major Street	Minor Street		
1	1	500	150
2 or more	1	600	150
2 or more	2 or more	600	200
1	2 or more	500	200

When the 85-percentile speed of major-street exceeds 40 mph in either an urban or rural area, or when the intersection lies within the built-up area of an isolated community having a population of less than 10,000, the Minimum Vehicular Volume warrant is 70 percent of the requirements above.

### Analysis

	No of lanes
Major Street	1
Minor Street	1

Time	Major Street		Minor Street		Warrants MET/NOT
	Volume on major street (total of both approaches)	Threshold	Veh/hour on higher volume minor street (one direction only)	Threshold	
		URBAN		URBAN	
		500		150	
8:00 AM	661		291		MET
5:00 PM	863		274		MET
7:00 AM	662		254		MET
4:00 PM	826		245		MET
2:00 PM	718		240		MET
6:00 PM	838		212		MET
3:00 PM	650		196		MET
12:00 PM	585		179		MET

Number of hours for which warrant met	8
Percentage by which warrant met	100.0%

<b>Warrant</b>	<b>MET</b>
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### Warrant 1B: Interruption of Continuous Traffic

The warrant is satisfied when, for each of any 8 hours of an average day, the traffic volumes given in the table below exist on the major street and on the higher-volume minor street approach to the intersection, and signal installation will not seriously disrupt progressive traffic flow.

Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)	Vehicles per hour on higher-volume minor-street approach (one direction only)
Major Street	Minor Street		
1	1	750	75
2 or more	1	900	75
2 or more	2 or more	900	100
1	2 or more	750	100

The major-street and minor -street volumes are for the same 8 hours. During those 8 hours, the direction of higher volume on the minor street may be on one approach during some hours and on the opposite approach during other hours.

When the 85-percentile speed of major-street exceeds 40 mph in either an urban or rural area, or when the intersection lies within the built-up area of an isolated community having a population of less than 10,000, the Interruption of Continuous Traffic warrant is 70 percent of the requirements above.

### Analysis

	No of lanes
Major Street	1
Minor Street	1

Time	Major Street		Minor Street		Warrants MET/NOT
	Volume on major (total of both approaches)	Threshold	Veh/hour on higher volume minor (one direction only)	Threshold	
		URBAN		URBAN	
		750		75	
8:00 AM	661		291		NOT MET
5:00 PM	863		274		MET
7:00 AM	662		254		NOT MET
4:00 PM	826		245		MET
2:00 PM	718		240		NOT MET
6:00 PM	838		212		MET
3:00 PM	650		196		NOT MET
12:00 PM	585		179		NOT MET

Number of hours for which warrant met	3
Percentage by which warrant met	37.5%

<b>Warrant</b>	<b>NOT MET</b>
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**Warrant 1: Combination of Warrants**

In exceptional cases, signals occasionally may be justified where no single warrant is satisfied but where Warrants 1A and 1B are satisfied to the extent of 80% or more of the stated values.

**Analysis**

80% of Warrant 1A Met  
80% of Warrant 1B Met

YES
NO

<b>Warrant</b>	<b>NOT MET</b>
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## Warrant 2: Four-Hour Vehicular Volumes

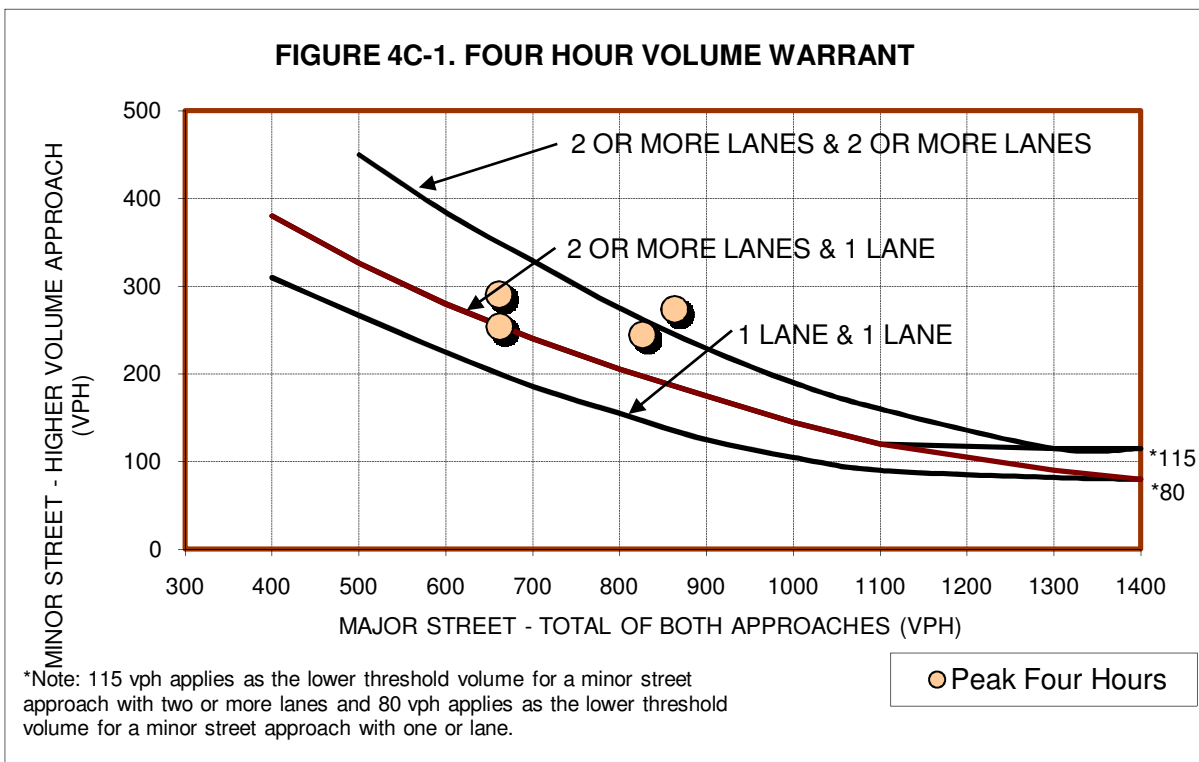
The Four Hour Volume Warrant is satisfied when each of any four hours of an average day the plotted points representing the vehicles per hour on the major street (total of both approaches) and the corresponding vehicles per hour on the higher volume minor street approach (one direction only) all fall above the curve in Figure 4C-1 for the existing combination of approach lanes.

### Analysis

	No of lanes
Major Street	1
Minor Street	1

#### Peak Four Hours

Time	Vehicles Per Hour	
	Major Street (Sum of both approaches)	Minor street (High volume approach)
8:00 AM	661	291
5:00 PM	863	274
7:00 AM	662	254
4:00 PM	826	245



<b>Warrant</b>	<b>Met</b>
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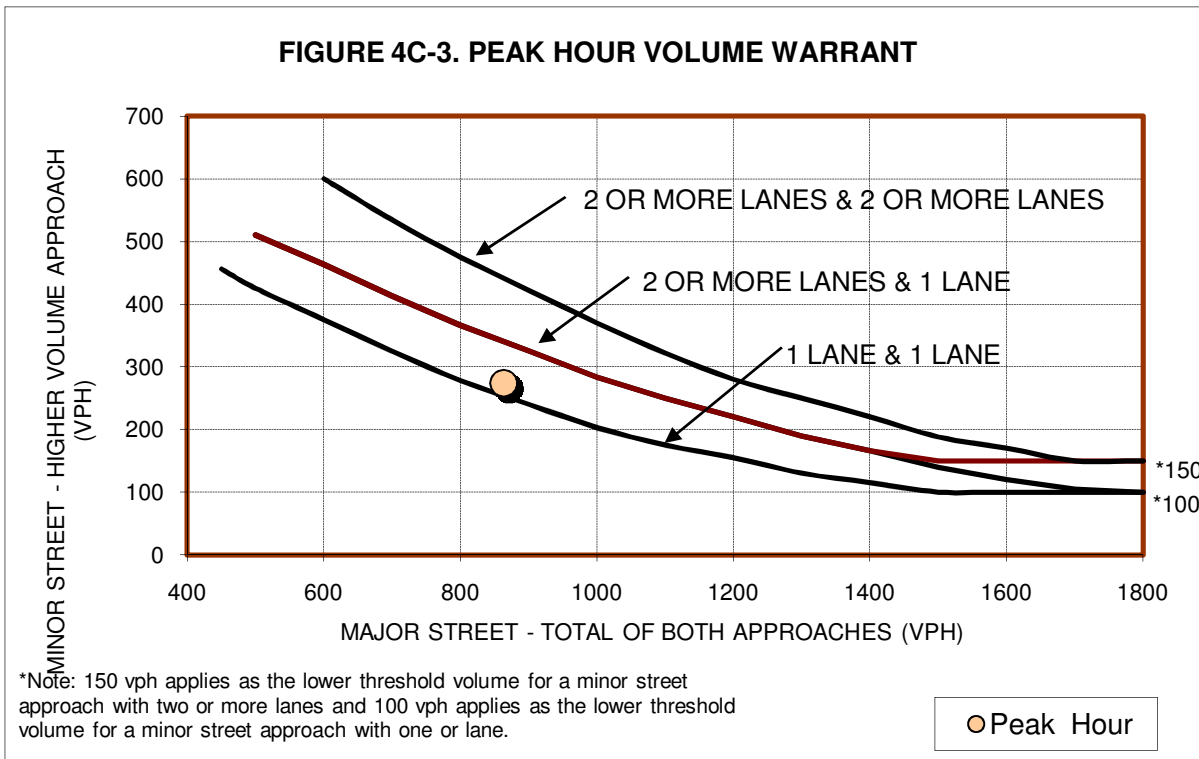
### Warrant 3B: Peak Hour Volume

The peak hour volume warrant is satisfied when the plotted point representing the vehicles per hour on the major street (total of both approaches) and the corresponding vehicles per hour of the higher volume minor street approach (one direction only) for one hour (any four consecutive 15-minute periods) of an average day falls above the curve in Figure 4-5 for the existing combination of approach lanes.

### Analysis

	No of lanes
Major Street	1
Minor Street	1

Time	Vehicles Per Hour	
	Major Street (Sum of both approaches)	Minor street (High volume approach)
5:00 PM	863	274



<b>Warrant</b>	<b>Met</b>
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### Warrant 1A: Minimum Vehicular Volume

The warrant is satisfied when, for each of any 8 hours of an average day, the traffic volumes given in the table below exist on the major street and on the higher-volume minor street approach to the intersection.

Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)	Vehicles per hour on higher-volume minor-street approach (one direction only)
Major Street	Minor Street		
1	1	500	150
2 or more	1	600	150
2 or more	2 or more	600	200
1	2 or more	500	200

When the 85-percentile speed of major-street exceeds 40 mph in either an urban or rural area, or when the intersection lies within the built-up area of an isolated community having a population of less than 10,000, the Minimum Vehicular Volume warrant is 70 percent of the requirements above.

### Analysis

	No of lanes
Major Street	1
Minor Street	1

Time	Major Street		Minor Street		Warrants MET/NOT
	Volume on major street (total of both approaches)	Threshold	Veh/hour on higher volume minor street (one direction only)	Threshold	
		URBAN		URBAN	
		500		150	
5:00 PM	834		313		MET
4:00 PM	762		245		MET
3:00 PM	725		241		MET
2:00 PM	713		240		MET
8:00 AM	625		224		MET
7:00 AM	568		189		MET
6:00 PM	706		189		MET
12:00 PM	599		179		MET

Number of hours for which warrant met	8
Percentage by which warrant met	100.0%

<b>Warrant</b>	<b>MET</b>
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### Warrant 1B: Interruption of Continuous Traffic

The warrant is satisfied when, for each of any 8 hours of an average day, the traffic volumes given in the table below exist on the major street and on the higher-volume minor street approach to the intersection, and signal installation will not seriously disrupt progressive traffic flow.

Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)	Vehicles per hour on higher-volume minor-street approach (one direction only)
Major Street	Minor Street		
1	1	750	75
2 or more	1	900	75
2 or more	2 or more	900	100
1	2 or more	750	100

The major-street and minor -street volumes are for the same 8 hours. During those 8 hours, the direction of higher volume on the minor street may be on one approach during some hours and on the opposite approach during other hours.

When the 85-percentile speed of major-street exceeds 40 mph in either an urban or rural area, or when the intersection lies within the built-up area of an isolated community having a population of less than 10,000, the Interruption of Continuous Traffic warrant is 70 percent of the requirements above.

### Analysis

	No of lanes
Major Street	1
Minor Street	1

Time	Major Street		Minor Street		Warrants MET/NOT
	Volume on major (total of both approaches)	Threshold	Veh/hour on higher volume minor (one direction only)	Threshold	
		URBAN		URBAN	
		750		75	
5:00 PM	834		313		MET
4:00 PM	762		245		MET
3:00 PM	725		241		NOT MET
2:00 PM	713		240		NOT MET
8:00 AM	625		224		NOT MET
7:00 AM	568		189		NOT MET
6:00 PM	706		189		NOT MET
12:00 PM	599		179		NOT MET

Number of hours for which warrant met	2
Percentage by which warrant met	25.0%

<b>Warrant</b>	<b>NOT MET</b>
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## Warrant 2: Four-Hour Vehicular Volumes

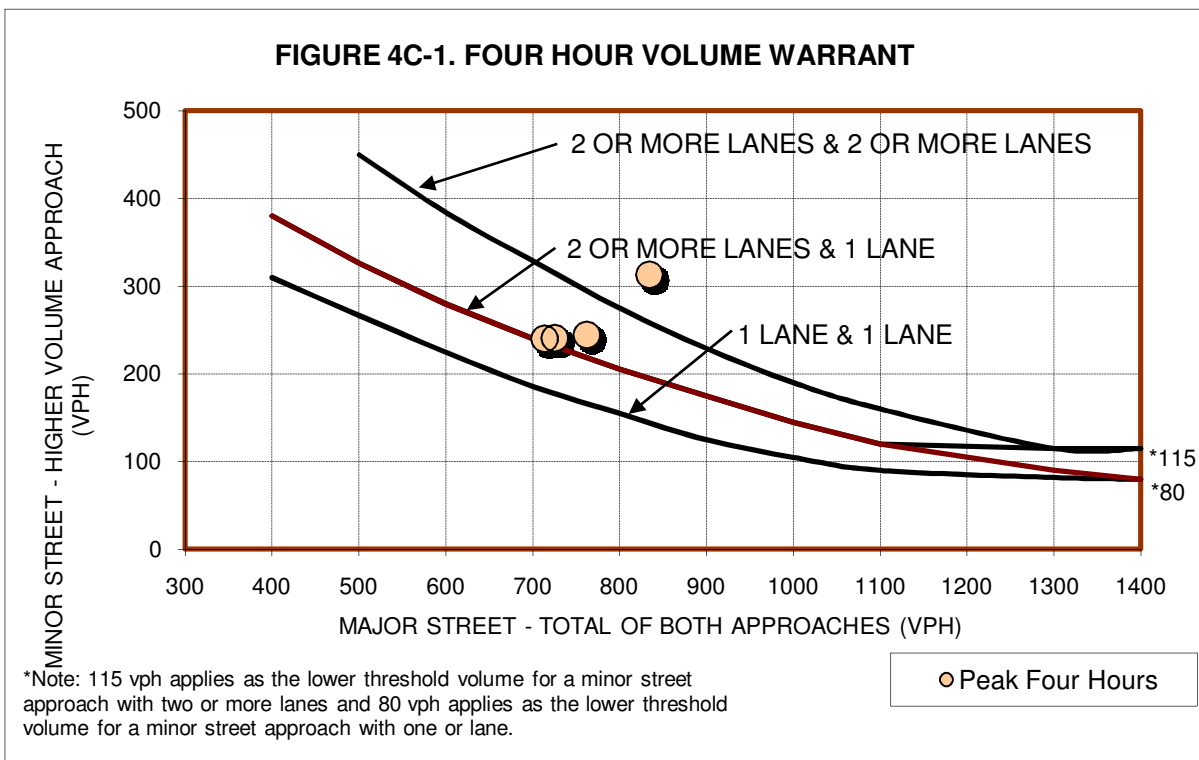
The Four Hour Volume Warrant is satisfied when each of any four hours of an average day the plotted points representing the vehicles per hour on the major street (total of both approaches) and the corresponding vehicles per hour on the higher volume minor street approach (one direction only) all fall above the curve in Figure 4C-1 for the existing combination of approach lanes.

### Analysis

	No of lanes
Major Street	1
Minor Street	1

#### Peak Four Hours

Time	Vehicles Per Hour	
	Major Street (Sum of both approaches)	Minor street (High volume approach)
5:00 PM	834	313
4:00 PM	762	245
3:00 PM	725	241
2:00 PM	713	240



<b>Warrant</b>	<b>Met</b>
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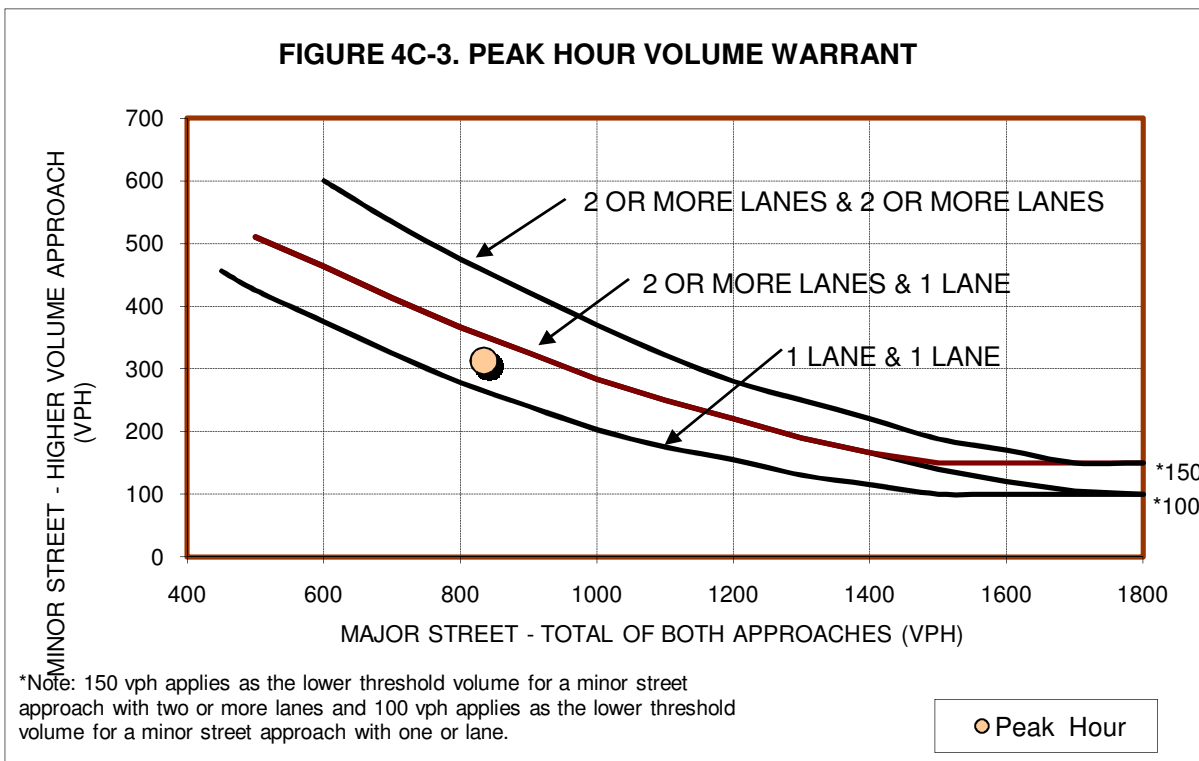
### Warrant 3B: Peak Hour Volume

The peak hour volume warrant is satisfied when the plotted point representing the vehicles per hour on the major street (total of both approaches) and the corresponding vehicles per hour of the higher volume minor street approach (one direction only) for one hour (any four consecutive 15-minute periods) of an average day falls above the curve in Figure 4-5 for the existing combination of approach lanes.

### Analysis

	No of lanes
Major Street	1
Minor Street	1

Time	Vehicles Per Hour	
	Major Street (Sum of both approaches)	Minor street (High volume approach)
5:00 PM	834	313



<b>Warrant</b>	<b>Met</b>
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### **Warrant 1: Combination of Warrants**

In exceptional cases, signals occasionally may be justified where no single warrant is satisfied but where Warrants 1A and 1B are satisfied to the extent of 80% or more of the stated values.

#### **Analysis**

80% of Warrant 1A Met  
80% of Warrant 1B Met

YES
NO

<b>Warrant</b>	<b>NOT MET</b>
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**INPUT DATA**

**Input data only in green fields**

Major/Minor Information  1 => N/S is major  
2 => E/W is major

Urban/Rural Information  1 => Urban  
2 => Rural

Total Intersection Approaches

**Lane configuration**

	No of lanes		
Major Street	<input style="width: 50px;" type="text" value="1"/>	<b>Scenario</b>	<input style="width: 100px;" type="text" value="Exist Thurs"/>
Minor Street	<input style="width: 50px;" type="text" value="1"/>		

	<b>Worst Case Delay</b>		<b>Total Vehicles per second</b>		<b>Total Vehicles on Approach</b>
Minor Street		<input style="width: 50px;" type="text" value="40.9"/>		<input style="width: 50px;" type="text" value="360"/>	

**Approaching Volume**

Hours	Major Street		Minor Street	
	N.B	S.B	E.B	W.B
12:00 AM	8	14	0	2
1:00 AM	5	6	1	3
2:00 AM	3	4	2	1
3:00 AM	2	5	0	3
4:00 AM	4	7	3	3
5:00 AM	24	17	4	4
6:00 AM	85	66	29	40
7:00 AM	339	229	178	189
8:00 AM	312	313	224	206
9:00 AM	351	229	136	128
10:00 AM	245	284	124	119
11:00 AM	258	315	163	128
12:00 PM	276	323	168	179
1:00 PM	258	300	139	126
2:00 PM	317	396	240	240
3:00 PM	330	395	241	196
4:00 PM	329	433	229	245
5:00 PM	324	510	313	274
6:00 PM	235	471	189	179
7:00 PM	183	292	126	152
8:00 PM	95	220	80	69
9:00 PM	77	173	39	117
10:00 PM	42	95	18	36
11:00 PM	19	32	6	6