COMPUTING STAFFING FOR STATE POLICE SERVICES

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INTRODUCTION

Staffing needed for state police services can be estimated manually using the staffing model developed for the Illinois Department of State Police (Raub 1987). It requires base data called "variables" and controlling elements labelled "parameters." Using tables and some elementary calculations will produce levels of staffing for districts or posts. This paper describes the steps to make such computations. An explanation of the theory appeared in the above referenced paper. Sections I and II show the values required, both parameters, and variables.

In Illinois, a county represents the smallest geographic unit for which common data are available. Smaller entities could be used; more computations then are required. For the Illinois Department of State Police, staffing is assigned to districts which comprise one or more counties. The process is first to compute staffing for each shift county by county, then add the shifts and the counties. Mileage and average daily traffic for primary (two-lane) and other rural roads cover sections outside incorporated municipalities. All controlled access mileage and ADT is used. Appendix A contains a worksheet used to record results of the computations.

The remainder of this paper shows how to compute staffing needed for calls for service, and for policing and patrol. "Calls for service" in the model are events to which the police attempt to respond immediately. These include accidents and criminal complaints. "Policing" is the time spent on enforcing laws and performing

other police services. Finally, "patrol" is the time spent by an officer in the moving vehicle observing, ready to take some action whether a call for service or policing.

Overhead is the final component. It represents number of officers required to administer the organization and staff specialized functions, e.g. public information. By definition, these officers normally do not patrol or respond to calls. The number needed is established by management; it is added after computations are made.

All computations except overhead yield positions (vehicles) required. These can be converted to officers by multiplying the number of positions times the officer coverage factor. This factor represents the ratio of hours to be served in a shift, e.g. 2920 hours annually for an 8-hour shift, divided by the average hours available per officer.

Starting in section III are the first set of computations. These produce values that appear elsewhere. Sections IV and V show computations for staffing. All previous values used in computations are referred to by the section, letter, and number under which they appeared. This same scheme is used in Appendix A.

VALUES REQUIRED FOR COMPUTING POLICE STAFFING

I. PARAMETERS (for each district)

A. Number of officers in specialized or administrative functions who are not considered normally available for patrol (overhead), also number of officers in central administrative functions including security.

B.1. Average annual hours available for patrolling duty (exclude scheduled time off, illness, training, and other duties which preclude assignment to a patrol).

2. Coverage Factor: 2920 ÷ annual hours (B.1.), yields the average number of officers required to cover one position on a shift every day of the year.

C.1. Number of hours officer actually is available for patrol during a shift when assigned (excludes lunch, breaks, and other required daily activities such as attendance at the post).

2. Daily availability: hours available (C.1.) ÷ 8, yields the proportion of the patrol an officer is available.

D. Average number of hours required by one officer to handle an accident (can be 85th percentile hours).

E. Average number of hours required by one officer to handle a criminal complaint (can be 85th percentile hours).

F. Percent of calls annually that can be served immediately (always less than 100 percent) for each of three shifts:

1. accidents

2. criminal complaints

G. Desired time of response in minutes, for each shift.

H. Percent of Average Daily Traffic (ADT) that occurs during each shift (usually statewide averages are taken).

I. Hours per patrol (time taken before passing the same spot again) by highway type:

1. controlled access

2. primary (state and U.S. marked routes) outside incorporated municipalities.

3. rural (county, township, etc.) outside incorporated municipalities.

J. Average patrolling speed by highway type:

Note: Parameters may be assigned to counties instead of districts; this increases the number of computations substantially.

II. VARIABLES (by county and where appropriate, by shift)

A. Area in square miles, or for linear patrol, length of road in miles.

B. Annual accidents occurring (or predicted) for each of three shifts. (Note: the starting and ending times for shifts are constant throughout the computations).

C. Annual number of criminal complaints handled (or predicted) for each of three shifts.

D. Coverage for each shift which is the number of vehicles to cover each projected position (0.0, 1.0). Use 2.0 for 2-officer units.

E. Miles of highway by highway type:

1. controlled access

2. primary (state and U.S. marked routes) outside incorporated municipalities

3. rural (county, township, etc.) outside incorporated municipalities

F. Average daily traffic (ADT) in 1,000's of vehicles per day by highway type:

1. controlled access

2. primary

3. rural (county, township, etc. and very low volume primary) outside incorporated municipalities

G. Highway volume by highway type: E x F, yields vehicle miles in 1000's.

H. Average number of lanes, one way, for controlled access highways (usually 2).

III. GENERAL COMPUTATIONS

Generally computations are done for each shift in each county. The first three (A-C) apply to the three highway types: controlled access, primary, and rural. The computation in D only applies to controlled access highways. Note: references which contain Roman numeral I are parameters; those with Roman numeral II are variables.

A. Average Daily Traffic (ADT) by shift and highway type:

- ADT (II.F.) x percent of ADT during shift (I.H.) ÷ 100

B. Traffic Volume (VMT) by shift and highway type:

- Highway volume (II.G.) x percent of ADT during shift (I.H.) ÷ 100

C. Proportional Speed (reduction in speed because of congestion) by shift and highway type:

- Use Table 1, given ADT per shift (III.A.)

D. Vehicles Required to Respond to Accidents by shift (controlled access highway only):

- Use Table 2, given ADT per shift for controlled access highways (III.A.) and average number of lanes, one-way, on controlled access highways (II.H.)

TABLE 1

PROPORTIONAL SPEED
BASED ON ADT

ADT (000's) (for shift)	Highway Type		
	Interstate	Primary	Rural
0.0 - 0.9	1.000	1.000	1.00
0.0 - 1.9	0.993	0.955	0.95
2.0 - 2.9	0.971	0.910	0.90
3.0 - 3.9	0.955	0.865	0.85
4.0 - 4.9	0.941	0.820	0.78
5.0 - 5.9	0.929	0.775	0.60
6.0 - 7.9	0.918	0.730	0.40
8.0 - 9.9	0.898	0.640	-
10.0 - 14.9	0.881	0.550	-
15.0 - 19.9	0.844	0.325	
20.0 - 24.9	0.812	-	
25.0 - 29.9	0.785	-	
30.0 - 39.9	0.740	-	
40.0 - 49.9	0.716		
50.0 - 59.9	0.677		
60.0 - 69.9	0.642		
70.0 - 79.9	0.610		
80.0 - 99.9	0.560		
100.0 - 119.9	0.500		
120.0 - 139.9	0.460		
140.0 - 159.9	0.410		
160.0 - 179.9	0.350		

TABLE 2

RESPONDING VEHICLES REQUIRED TO HANDLE
ACCIDENTS GIVEN AVERAGE NUMBER OF LANES
(ONE WAY) AND ADT ON CONTROLLED ACCESS HIGHWAYS

ADT (000's) (for shift)	Lanes (One way)		
	2	3	4+
0 - 25	1	1	1
30 - 39	2	1	1
40 - 49	2	2	1
50+	2	2	2

IV. COMPUTING CALLS FOR SERVICE

Calls for service represent events to which the police are expected to respond as soon as possible. In this model, calls for service comprise accidents and criminal complaints. Unless specifically noted, each computation is performed for each of the three shifts within a county. The computations yield positions to be manned. Only after computing positions to handle calls, (IV), and policing and patrolling (V) are the shifts combined to a county then combined to a district. Next, the number of positions is multiplied by the shift coverage factor which can be 0.0 for no coverage to 2.0 for two-officer units. Generally the factor is 1.0. Finally, the number of officers needed to fill the positions is computed at the end.

Note: In the computations, the value 2920 often is shown. It represents the number of hours annually in one eight-hour shift; 8760 is total hours in a year of 365 days.

A. Accidents

1. Average Rate of Accidents:

   - annual accidents (II.B.1) ÷ 2920 x time in hours required to handle one accident (I.D.)

2. Base Number Positions Required:

   - use Table 3, given the annual percent of accidents that will be handled immediately (I.F.1.)

3. Total Positions Required:

   - results of A.2. x vehicles needed (III.D.)

TABLE 3

NUMBER OF POSITIONS REQUIRED TO
HANDLE CALLS GIVEN RATE OF OCCURRENCE

Percent of Annual Number Handled Immediately

Rate	75%	80%	85%	90%	95%	97%	98%	99%
0.01	0	0	0	0	0	0	0	0
0.02	0	0	0	0	0	0	0	1
0.03	0	0	0	0	0	0	1	1
0.04	0	0	0	0	0	1	1	1
0.05	0	0	0	0	0	1	1	1
0.06	0	0	0	0	1	1	1	1
0.08	0	0	0	0	1	1	1	1
0.10	0	0	0	0	1	1	1	1
0.15	0	0	0	1	1	1	1	2
0.20	0	0	1	1	1	1	1	2
0.25	0	1	1	1	1	1	2	2
0.30	1	1	1	1	1	2	2	2
0.40	1	1	1	1	2	2	2	2
0.50	1	1	1	1	2	2	2	3
0.60	1	1	1	2	2	2	3	3
0.80	1	1	2	2	2	3	3	3
1.00	2	2	2	2	3	3	3	4
1.25	2	2	2	3	3	4	4	4
1.50	2	2	3	3	4	4	4	5
2.00	3	3	3	4	5	5	5	6
2.50	3	4	4	5	5	6	6	7
3.00	4	4	5	5	6	7	7	8
3.50	5	5	5	6	7	7	8	8
4.00	5	6	6	7	8	8	9	9
5.00	6	7	7	8	9	10	10	11
6.00	8	8	9	9	10	11	12	12
7.00	9	9	10	10	12	12	13	14
8.00	10	10	11	12	13	14	14	15
9.00	11	11	12	13	14	15	16	17
10.00	12	13	13	14	15	16	17	18

B. Criminal Complaints:

1. Average Rate of Criminal Complaints

   - annual criminal complaints (II.2.) ÷ 2920 x time in hours required to handle one complaint (I.E)

2. Number of Positions Required:

   - use Table 3, given the annual percent of criminal complaints that can be handled immediately (I.F.2.)

C. Positions - Accident and Criminal Complaints:

   - sum: A.3. + B.2

D. Minimized Response Time

1. Number of Positions Required (area or linear patrol).

   - Area - use Table 4a given area in square miles and expected time of response in minutes (I.G.)

   - Linear - use Table 4b given length of the highway and expected time of response in minutes (I.G.)

2. Adjusted Positions

   - round up results of D.1. to nearest 0.5 positions

   Note: Responding speed is assumed to be 60 mph. For a lower speed, multiply the result in D.1. by: 60 ÷ responding speed.

E. Required for Calls for Service (compute by shift)

   - positions for accidents and criminal complaints (C.)

   or

   adjusted positions for minimized response time (D.2.)

F. Unobligated Positions, or time not spent handling calls:

1. Hours Busy

   - accidents (II.B.) x hours per accident (I.D.) + criminal complaints (II.C.) x hours per complaint (I.E.).

2. Unobligated Positions

   - positions required for calls (IV.E.) - (hours busy (F.1.) ÷ 2920)

TABLE 4a

NUMBER OF POSITIONS
REQUIRED TO MINIMIZE
RESPONSE TIME - AREA PATROL

Area in Square Miles	Maximum Time in Minutes 5	10	15	20	30	40	60
100	1.3	0.7	0.4	0.3	0.2	0.2	0.1
200	1.9	0.9	0.6	0.5	0.3	0.2	0.2
300	2.3	1.2	0.8	0.6	0.4	0.3	0.2
400	2.7	1.3	0.9	0.7	0.4	0.3	0.2
500	3.0	1.5	1.0	0.7	0.5	0.4	0.2
600	3.3	1.6	1.1	0.8	0.5	0.4	0.3
700	3.5	1.8	1.2	0.9	0.6	0.4	0.3
800	3.8	1.9	1.3	0.9	0.6	0.5	0.3
900	4.0	2.0	1.3	1.0	0.7	0.5	0.3
000	4.2	2.1	1.4	1.1	0.7	0.5	0.4
200	4.6	2.3	1.5	1.2	0.8	0.6	0.4
400	5.0	2.5	1.7	1.2	0.8	0.6	0.4
600	5.3	2.7	1.8	1.3	0.9	0.7	0.4
800	5.7	2.8	1.9	1.4	0.9	0.7	0.5
000	6.0	3.0	2.0	1.5	1.0	0.7	0.5
500	6.7	3.3	2.2	1.7	1.1	0.8	0.6
000	7.3	3.7	2.4	1.8	1.2	0.9	0.6
000	8.4	4.2	2.8	2.1	1.4	1.1	0.7
000	9.4	4.7	3.1	2.4	1.6	1.2	0.8

TABLE 4b

NUMBER OF POSITIONS
REQUIRED TO MINIMIZE
RESPONSE TIME - LINEAR PATROL

Length in Miles	Maximum Time in Minutes 5	10	15	20	30	40	60
10	1.0	0.5	0.3	0.3	-	-	-
20	2.0	1.0	0.7	0.5	0.3	-	-
30	3.0	1.5	1.0	0.8	0.5	0.4	0.3
40	4.0	2.0	1.3	1.0	0.7	0.5	0.3
50	5.0	2.5	1.7	1.3	0.8	0.6	0.4
60	6.0	3.0	2.0	1.5	1.0	0.8	0.5
100	10.0	5.0	3.3	2.5	1.7	1.3	0.8

V. POLICING AND PATROLLING

Policing is the time spent handling enforcement and other police related services except accidents and criminal complaints. Traffic tickets and motorist assistance are examples. Patrolling is the time spent in the police vehicle observing. Generally, policing results from patrol. For the model, time required for each is handled separately.

Like calls for service, computations for policing and patrolling are performed each of three shifts within a county. Additionally, within each shift, the computations are performed for each highway type. They are added together to obtain the number of positions required for a shift. Unless specifically stated, computation by highway type is presumed.

One adjustment is required. The number of positions required for policing and patrolling are, in part, handled by officers assigned to calls for service when they are not engaged. The non-obligated positions computed earlier first must be subtracted from the positions required for policing and patrolling. What remains is the number of additional positions needed. It may not be less than zero.

Policing

Positions required for policing derives from the number of hours expected to be spent performing law enforcement services while the officer is on patrol. It is related directly to the volume of traffic as measured in vehicle miles. Policing includes traffic stops, motorist services, towing abandoned vehicles, and miscellaneous highway services, e.g. traffic control.

A. Policing

Number of positions required (computed for each shifts, by highway type).

- use Table 5, given volume by shift (VMT) (III.B)

Patrolling

Patrolling is travel along a section of a highway or highways. During patrol, the officer may take action. However, this activity already is addressed in the computations for policing. The portion of highway to be covered depends upon the frequency of patrol in hours past a specific point and the patrolling speed. For the model, speeds of 50 mph on controlled access roads, 45 mph on primary roads, and 40 mph on rural roads are assumed. The patrolling speed decreases as congestion, measured in terms of Average Daily Traffic, increases.

B. Patrolling

1. Rate of Patrol (uses round trip or twice the highway mileage).

   - 2.0 x miles of highway (II.E.) ÷ (patrolling speed (I.J.) x proportional speed (III.C.))

2. Positions Required for Patrol.

   - rate of patrol (B.1.) ÷ hours per patrol (I.1.)

C. Adjusted Positions for Policing and Patrolling

   - (positions for policing (A.) + positions for patrolling (B.2)) ÷ daily availability (I.C.2.)

TABLE 5

NUMBER OF POSITIONS FOR POLICING
BY HIGHWAY TYPE

VMT* (000's)	Highway Type: Controlled Access	Primary	Rural
0 - 49	0.1	0.1	0.0
50 - 99	0.2	0.2	0.0
100 - 199	0.3	0.3	0.1
200 - 299	0.4	0.4	0.2
300 - 399	0.6	0.6	0.3
400 - 499	0.7	0.7	0.4
500 - 749	0.9	0.9	0.5
750 - 999	1.3	1.1	0.8
1000 - 1499	1.8	1.3	1.2
1500 - 1999	2.4	1.3	1.0
2000 - 2499	3.0	1.0	0.6
2500 - 2999	3.6	0.5	N/A
3000 - 3499	4.2	N/A	
3500 - 3999	4.7		
4000 - 4499	5.2		
4500 - 4999	5.7		
5000 - 5999	6.3		

*For rural highways this is ADT.

Additional Positions Needed

The positions needed to handle calls for service are engaged in that activity only a portion of the time the officers are on duty. Remaining time is spent policing and patrolling (also considered as "unobligated"). Therefore, only a few positions may need to be added to meet the computed needs for policing and patrolling. To obtain this value, the number of positions previously computed for unobligated time is subtracted from the adjusted positions for policing and patrolling. A minimum value of zero is used.

D. Additional Policing and Patrolling Positions:

- adjusted policing and patrolling positions (C.) - unobligated positions (IV.F.2.)

or

- zero, whichever is greater.

VI. OFFICERS REQUIRED TO STAFF POLICE

The number of positions can be converted readily into officers. Each position is assumed to be needed daily throughout the year. Therefore, more than one officer is needed to fill that one position. The positions first are cumulated for the three shifts to a county, then by counties into districts. The final staffing computations are based on a district. Conversion to officers needed can be the final step performed.

A. Officers Needed for Services

1. Calls for Service:

   - positions required (IV.E.)

2. Policing and Patrolling:

   - additional positions (V.D.)

3. Total Positions:

   - A.1. + A.2

B. Officers required:

   - total positions (A.3.) x officers per position (I.B.2.)

VII. TOTAL OFFICERS PER DISTRICT

Sum total of officers for each county; add overhead (I.A.).

APPENDIX A

STAFFING A STATE POLICE AGENCY
WORKSHEET FOR COMPUTATIONS

The worksheet following is intended to be a guide in making computations. Part 1 contains basic information to be cumulated to a county before computing officers. This way both positions and staffing for those positions is shown for each county. Part 2 provides for combining counties into districts. One Part 1 worksheet is required for each county in the district.

PART 1

GENERAL AND COUNTY DATA

I. GENERAL PARAMETERS

District:

Counties included:

Shift Times: 1st -

2nd -

3rd -

A. Number of officers assigned to specialized or administrative duties:

B. 1. Average annual hours available for patrol:

2. Coverage: 2920 / (B1) =

C. 1. Number of hours in shift officer available:

2. Daily Availability: (C1) / 8 =

D. Hours required to handle an accident:

E. Hours required to handle a criminal complaint:

	Shift 1	Shift 2	Shift 3
F. Percent of calls handled immediately			
1. Accidents:			
2. Criminal Complaints:			
G. Response time (minutes):			
H. Percent of daily traffic:			

	Highway Type		
	Controlled Access	Primary	Rural
I. Hours per patrol:			
J. Average patrolling speed (mph):			

II. COUNTY VARIABLES (repeat for each county)

County Name:

Type of Patrol: AREA or LINEAR

A. Area in officers square miles or length of highway in miles:

Category	Shift 1	Shift 2	Shift 3
B. Accidents (annual):			
C. Criminal Complaints (annual):			
D. Coverage for each shift:*			

*For 2-officer units use 2.0.:

	Highway Type		
	Controlled Access	Primary	Rural
E. Miles:			
F. ADT (000's):			
G. Volume (E x F):			
H. Avg. nbr. of lanes (one way):		--	--

	Shift 1	Shift 2	Shift 3

III. GENERAL COMPUTATIONS

A. ADT per shift, (II.F) x (I.H.) ÷ 100

1. Controlled Access:

2. Primary:

3. Rural:

	Shift 1	Shift 2	Shift 3

B. Volume per shift, (II.G.) x I.H.) ÷ 100

1. Controlled Access:

2. Primary:

3. Rural:

C. Proportional Speed (by shift)

(Use Table A1, given III.A.)

1. Controlled access (III.A.1.):

2. Primary (III.A.2.):

3. Rural (III.A.3.):

D. Vehicles required to respond

(Use Table A2, given III.A.1. and II.H.)

Controlled Access (only):

TABLE A1

PROPORTIONAL SPEED
BASED ON ADT

ADT (000's) (for shift)	Highway Type		
	Interstate	Primary	Rural
0.0 - 0.9	1.000	1.000	1.00
0.0 - 1.9	0.993	0.955	0.95
2.0 - 2.9	0.971	0.910	0.90
3.0 - 3.9	0.955	0.865	0.85
4.0 - 4.9	0.941	0.820	0.78
5.0 - 5.9	0.929	0.775	0.60
6.0 - 7.9	0.918	0.730	0.40
8.0 - 9.9	0.898	0.640	-
10.0 - 14.9	0.881	0.550	-
15.0 - 19.9	0.844	0.325	
20.0 - 24.9	0.812	-	
25.0 - 29.9	0.785	-	
30.0 - 39.9	0.740	-	
40.0 - 49.9	0.716		
50.0 - 59.9	0.677		
60.0 - 69.9	0.642		
70.0 - 79.9	0.610		
80.0 - 99.9	0.560		
100.0 - 119.9	0.500		
120.0 - 139.9	0.460		
140.0 - 159.9	0.410		
160.0 - 179.9	0.350		

TABLE A2

RESPONDING VEHICLES REQUIRED TO HANDLE
ACCIDENTS GIVEN AVERAGE NUMBER OF LANES
(ONE WAY) AND ADT ON CONTROLLED ACCESS HIGHWAYS

ADT (000's) (for shift)	Lanes (One way)		
	2	3	4+
0 - 25	1	1	1
30 - 39	2	1	1
40 - 49	2	2	1
50+	2	2	2

IV. CALLS FOR SERVICE (positions required)

	Shift 1	Shift 2	Shift 3	Total
A. Accidents				
1. Rate: (II.B. x I.D. ÷ 2920)				
2. Base positions: (use Table A3, given IV.A.1.)				
3. Positions: (IV.A.2. x III.D.)				
B. Criminal complaints				
1. Rate: (II.C. x I.E. ÷ 2920)				
2. Positions: (use Table A3, given IV.B.1.)				
C. Accident and Criminal Complaint positions (IV.A.3 + IV.B.2.):				
D. Minimized response time positions required (either 1. or 2.)				
1. Area: (use Table A4a given expected time of response I.G.)				
2. Linear: (use Table A4b given expected time of response I.G.)				
*Note: for average response less than speeds 60 mph, multiply the results by 60 ÷ actual average speed.				
E. Positions required for calls (IV.C. or IV.D. which is greater):				
F. Unobligated positions				
1. Hours busy: II.B. x I.D. + II.C. x I.E.				
2. Positions: (IV.E. - IV.F.1.) ÷ 2920				

TABLE A3

NUMBER OF POSITIONS REQUIRED TO
HANDLE CALLS GIVEN RATE OF OCCURRENCE

Percent of Annual Number Handled Immediately

Rate	75%	80%	85%	90%	95%	97%	98%	99%
0.01	0	0	0	0	0	0	0	0
0.02	0	0	0	0	0	0	0	1
0.03	0	0	0	0	0	0	1	1
0.04	0	0	0	0	0	1	1	1
0.05	0	0	0	0	0	1	1	1
0.06	0	0	0	0	1	1	1	1
0.08	0	0	0	0	1	1	1	1
0.10	0	0	0	0	1	1	1	1
0.15	0	0	0	1	1	1	1	2
0.20	0	0	1	1	1	1	1	2
0.25	0	1	1	1	1	1	2	2
0.30	1	1	1	1	1	2	2	2
0.40	1	1	1	1	2	2	2	2
0.50	1	1	1	1	2	2	2	3
0.60	1	1	1	2	2	2	3	3
0.80	1	1	2	2	2	3	3	3
1.00	2	2	2	2	3	3	3	4
1.25	2	2	2	3	3	4	4	4
1.50	2	2	3	3	4	4	4	5
2.00	3	3	3	4	5	5	5	6
3.00	4	4	5	5	6	7	7	8
3.50	5	5	5	6	7	7	8	8
4.00	5	6	6	7	8	8	9	9
5.00	6	7	7	8	9	10	10	11
6.00	8	8	9	9	10	11	12	12
7.00	9	9	10	10	12	12	13	14
8.00	10	10	11	12	13	14	14	15
9.00	11	11	12	13	14	15	16	17
10.00	12	13	13	14	15	16	17	18

TABLE A4a

NUMBER OF POSITIONS
REQUIRED TO MINIMIZE
RESPONSE TIME - AREA PATROL

Area in Square Miles	Maximum Time in Minutes 5	10	15	20	30	40	60
100	1.3	0.7	0.4	0.3	0.2	0.2	0.1
200	1.9	0.9	0.6	0.5	0.3	0.2	0.2
300	2.3	1.2	0.8	0.6	0.4	0.3	0.2
400	2.7	1.3	0.9	0.7	0.4	0.3	0.2
500	3.0	1.5	1.0	0.7	0.5	0.4	0.2
600	3.3	1.6	1.1	0.8	0.5	0.4	0.3
700	3.5	1.8	1.2	0.9	0.6	0.4	0.3
800	3.8	1.9	1.3	0.9	0.6	0.5	0.3
900	4.0	2.0	1.3	1.0	0.7	0.5	0.3
000	4.2	2.1	1.4	1.1	0.7	0.5	0.4
200	4.6	2.3	1.5	1.2	0.8	0.6	0.4
400	5.0	2.5	1.7	1.2	0.8	0.6	0.4
600	5.3	2.7	1.8	1.3	0.9	0.7	0.4
800	5.7	2.8	1.9	1.4	0.9	0.7	0.5
000	6.0	3.0	2.0	1.5	1.0	0.7	0.5
500	6.7	3.3	2.2	1.7	1.1	0.8	0.6
000	7.3	3.7	2.4	1.8	1.2	0.9	0.6
000	8.4	4.2	2.8	2.1	1.4	1.1	0.7
000	9.4	4.7	3.1	2.4	1.6	1.2	0.8

TABLE A4b

NUMBER OF POSITIONS
REQUIRED TO MINIMIZE
RESPONSE TIME - LINEAR PATROL

Length in Miles	Maximum Time in Minutes 5	10	15	20	30	40	60
10	1.0	0.5	0.3	0.3	-	-	-
20	2.0	1.0	0.7	0.5	0.3	-	-
30	3.0	1.5	1.0	0.8	0.5	0.4	0.3
40	4.0	2.0	1.3	1.0	0.7	0.5	0.3
50	5.0	2.5	1.7	1.3	0.8	0.6	0.4
60	6.0	3.0	2.0	1.5	1.0	0.8	0.5
100	10.0	5.0	3.3	2.5	1.7	1.3	0.8

TABLE A5

NUMBER OF POSITIONS FOR POLICING
BY HIGHWAY TYPE

VMT* (000's)	Highway Type: Controlled Access	Primary	Rural
0 - 49	0.1	0.1	0.0
50 - 99	0.2	0.2	0.0
100 - 199	0.3	0.3	0.1
200 - 299	0.4	0.4	0.2
300 - 399	0.6	0.6	0.3
400 - 499	0.7	0.7	0.4
500 - 749	0.9	0.9	0.5
750 - 999	1.3	1.1	0.8
1000 - 1499	1.8	1.3	1.2
1500 - 1999	2.4	1.3	1.0
2000 - 2499	3.0	1.0	0.6
2500 - 2999	3.6	0.5	N/A
3000 - 3499	4.2	N/A	
3500 - 3999	4.7		
4000 - 4499	5.2		
4500 - 4999	5.7		
5000 - 5999	6.3		

*For rural highways this is ADT.

V. POLICING AND PATROLLING

	Shift 1	Shift 2	Shift 3	Total
A. Positions for policing: (use Table A5, given VMT per shift, (III.B.)				
1. Controlled access:				
2. Primary:				
3. Rural:				
B. Positions for patrolling:				
1. Rate of patrol: (2.0 x II.E.) ÷ (I.J. x III.C.)				
a. Controlled access:				
b. Primary:				
c. Rural:				
2. Positions: (V.B.1. ÷ I.I.)				
C. Adjusted positions for policing and patrolling: (V.A. + V.B.2) ÷ I.C.2.				
D. Additional positions required: (V.C. - IV.F.2. or 0.0) (whichever is greater)				

VI. Staffing

A. Officers required for services				
1. Calls for service: (IV.E.)				
2. Policing and patrolling: (V.D.)				
3. Total positions: (VI.A.1. + VI.A.2.)				
4. Positions times coverage factor: (A.3. x II.D.)				
B. Officers required: (VI.A.4. x I.B.2.)				

PART 2

DISTRICT STAFFING

VII. Total Officers per District

	County	Total (from VI.B.)
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
11.		
12.		
13.		
14.		
15.		

Total Officers

+

Overhead (I.A.)

Total Officers