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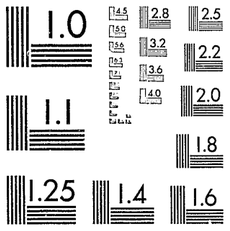

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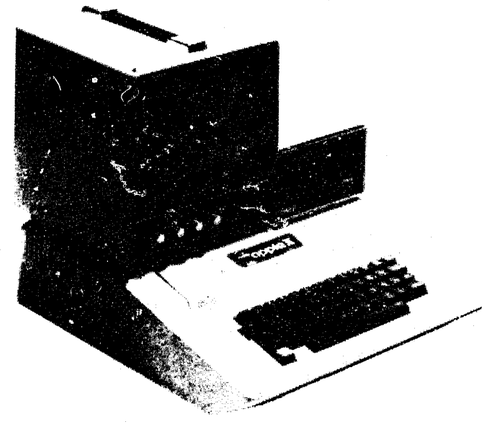
Training Materials for PATROL / PLAN, BEAT / PLAN, and DATA / PLAN Software on Apple-II Microcomputer



THE INSTITUTE FOR PUBLIC PROGRAM ANALYSIS

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SAINT LOUIS, MISSOURI 63132
(314) 991-0300

October, 1979

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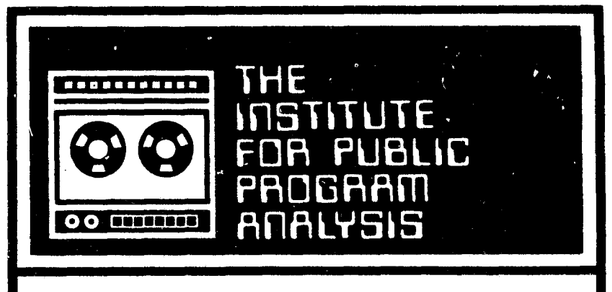

POLICE / PLAN — AN EASY-TO-USE RESOURCE ALLOCATION SYSTEM:

Training Materials for PATROL / PLAN, BEAT / PLAN, and DATA / PLAN Software on Apple-II Microcomputer

1328 BAUR BOULEVARD • SAINT LOUIS, MISSOURI 63132

EXECUTIVE DIRECTOR
Nelson B. Heller, Ph.D.

ASSOCIATE DIRECTOR
William W. Stenzel, D.Sc.

William W. Stenzel, D.Sc.
Richard A. Kolde
Allen D. Gill
Nelson B. Heller, Ph.D.

October 1979

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ABSTRACT

This report presents a series of exercises designed to demonstrate the capabilities of POLICE/PLAN, an easy-to-use police resource allocation planning system developed for the Apple II microcomputer. The exercises deal with an analysis of patrol operations in the hypothetical community of Law City utilizing all three of the system's components--PATROL/PLAN, BEAT/PLAN, and DATA/PLAN. All necessary background information and input data are specified in the report. The exercises assume that the user is familiar with the procedures for using POLICE/PLAN on an Apple II microcomputer.

This report is one of the products of the project "Easy-to-Use Police Resource Allocation Planning Tools--Practical Derivatives of Sophisticated Computer-Based Planning Models." The project was conducted by The Institute for Public Program Analysis, with funding from the National Institute of Law Enforcement and Criminal Justice of the Law Enforcement Assistance Administration (grant #78NI-AX-0015). POLICE/PLAN has been field tested in three police departments, and prototype versions have been obtained by 29 additional agencies. Field experience has shown that POLICE/PLAN can be used by persons with no prior data processing experience and can bring sophisticated planning capabilities within the reach of small and medium-sized police departments.

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PREFACE

This report is one of the products of the project "Easy-to-Use Police Resource Allocation Planning Tools--Practical Derivatives of Sophisticated Computer-Based Planning Models." The project was conducted by The Institute for Public Program Analysis, a private non-profit research firm located in St. Louis, Missouri. The project was funded by the National Institute of Law Enforcement and Criminal Justice of the Law Enforcement Assistance Administration (grant #78NI-AX-0015).

The primary product of the project is POLICE/PLAN, a police resource allocation planning system used with low cost ($300-$3800) microcomputers or programmable calculators. The findings and products of the study are presented in five reports:

- POLICE/PLAN--An Easy-to-Use Resource Allocation System: Executive Summary, Richard A. Kolde, William W. Stenzel, Allen D. Gill, and Nelson B. Heller, St. Louis: The Institute for Public Program Analysis, October 1979;

- POLICE/PLAN--An Easy-to-Use Resource Allocation System: User's Manual and Training Materials for PATROL/PLAN Software on TI Programmable 59 Calculator, Richard A. Kolde, Nelson B. Heller, William W. Stenzel, and Allen D. Gill, St. Louis: The Institute for Public Program Analysis, October 1979;

- POLICE/PLAN--An Easy-to-Use Resource Allocation System: User's Manual and Training Materials for PATROL/PLAN Software on TRS-80 Microcomputer, William W. Stenzel, Richard A. Kolde, Allen D. Gill, and Nelson B. Heller, St. Louis: The Institute for Public Program Analysis, October 1979;

- POLICE/PLAN--An Easy-to-Use Resource Allocation System: User's Manual for PATROL/PLAN, BEAT/PLAN, and DATA/PLAN Software on Apple II Microcomputer, Richard A. Kolde, William W. Stenzel, Allen D. Gill, and Nelson B. Heller, St. Louis: The Institute for Public Program Analysis, October 1979; and

- POLICE/PLAN--An Easy-to-Use Resource Allocation System: Training Materials for PATROL/PLAN, BEAT/PLAN, and DATA/PLAN Software on Apple II Microcomputer,

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William W. Stenzel, Richard A. Kolde, Allen D. Gill, and Nelson B. Heller, St. Louis: The Institute for Public Programming Analysis, October 1979.

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Finally, a special note of thanks is extended to Mrs. Vicki O'Dell and Mrs. Nancy McCloud, who typed most of the material contained in the project's reports and ably supervised the typing of the remainder.

Information about how to obtain the POLICE/PLAN software and documentation is available from:

- Executive Director
  The Institute for Public Program Analysis
  1328 Baur Boulevard
  St. Louis, Missouri 63132

or

- Director
  Police Division
  National Institute of Law Enforcement
  and Criminal Justice
  Washington, D.C. 20531

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CHAPTER I

INTRODUCTION

This document presents training exercises designed to give a hands-on introduction to the use of POLICE/PLAN software for the Apple II microcomputer. POLICE/PLAN is an easy-to-use police resource allocation system developed by The Institute for Public Program Analysis as part of the project "Easy-to-Use Police Resource Allocation Planning Tools--Practical Derivatives of Sophisticated Computer-Based Planning Models." The project was funded by the National Institute of Law Enforcement and Criminal Justice of the Law Enforcement Assistance Administration (grant number 78NI-AX-0015).

POLICE/PLAN supplies estimates of field operations performance characteristics such as: average workload and travel time for each beat car, percent of dispatches that are cross-beat, minimum patrol interval, and the percent of time the entire patrol force is busy (i.e., no cars are available to accept dispatch assignments). In addition, POLICE/PLAN will calculate the minimum number of cars needed to achieve user-specified values for these variables. Thus, POLICE/PLAN can help a police department determine how many patrol cars are needed and when and where they should be deployed. With this information, departments can more easily assess or substantiate existing or proposed field operations budgets.

The system has been field tested in three police departments,

and prototype versions have been obtained by 29 additional agencies. Field experience has shown that POLICE/PLAN can be used by persons with no prior data processing experience and can bring sophisticated planning capabilities within the reach of small and medium-sized police departments. For more information, refer to POLICE/PLAN--An Easy-to-Use Resource Allocation System: Executive Summary.

A. Purpose of the Training Exercises

These training exercises were developed in the process of field testing the POLICE/PLAN system. Personnel in three field test police departments completed a set of much more comprehensive exercises than those described here. The field test exercises required the use of both microccmputer and calculator versions of POLICE/PLAN, whereas the exercises in this document deal exclusively with the Apple II microcomputer. The experiences of field test participants were instrumental in the development of the final version of POLICE/PLAN.

The exercises outlined in this document are designed to give POLICE/PLAN users an introduction to the capabilities of three POLICE/PLAN software components--PATROL/PLAN, BEAT/PLAN, and DATA/PLAN. Not all of the system's capabilities, however, will be utilized in the course of completing the exercises.

B. Overview of the Training Exercises

The training exercises in chapters III, IV, and V deal with several police resource allocation problems for a hypothetical community called Law City. Background information on Law City is contained in Chapter II. All data needed to complete the exercises is presented in Chapter II, Appendix A, or the description of each

exercise. Chapter III deals with data collection and preparation, and requires use of the DATA/PLAN program. In Chapter IV, PATROL/PLAN is used to examine several patrol deployment questions. In Chapter V, BEAT/PLAN is used to analyze and design alternative beat plans.

Appendix A lists the dispatch data which serves as the basis for many of the exercises. Appendix B discusses the derivation of POLICE/PLAN input items from dispatch data and other sources. Appendixes C, D, and E show the solutions to the DATA/PLAN, PATROL/PLAN, and BEAT/PLAN exercises.

The one prerequisite for completing the exercises is familiarity with the POLICE/PLAN system and procedures for using the Apple II microcomputer.* It is assumed that the reader has thoroughly reviewed the POLICE/PLAN user's manual.

*POLICE/PLAN is designed for use on an Apple II microcomputer with 32K RAM, one disk drive, and APPLESOFT BASIC.

CHAPTER II

BACKGROUND INFORMATION

A. Description of Law City

These training exercises deal with several police resource allocation problems for a hypothetical community called Law City. A suburb in a large metropolitan area, Law City has a population of approximately 35,000, an area of 15.3 square miles, and a total of 323.4 miles of patrollable streets and alleys. For data gathering purposes, the city is divided into 29 reporting areas numbered from 100 to 128 (see Figure 2-1). The commercial portion of the city is concentrated in an area covered by reporting areas 109, 110, 112, 113, and 119. Areas 101 through 105 contain the residential portion of the city while reporting areas 120 through 128 contain older parts of the community that include both residential and commercial establishments. Reporting areas 100, 106, and 107 are undeveloped portions of the city.

B. Police Operations in Law City

The Law City Police Department operates three 8-hour shifts per day: the Night shift (midnight to 8:00 a.m.), the Day shift (8:00 a.m. to 4:00 p.m.), and the Afternoon shift (4:00 p.m. to midnight). The patrol function of the department is based on the concept of individual beats for each patrol unit with a centralized communications center which receives calls for service (CFS), and dispatches patrol units. The department currently fields four patrol units on each shift using the beat structure shown in Figure

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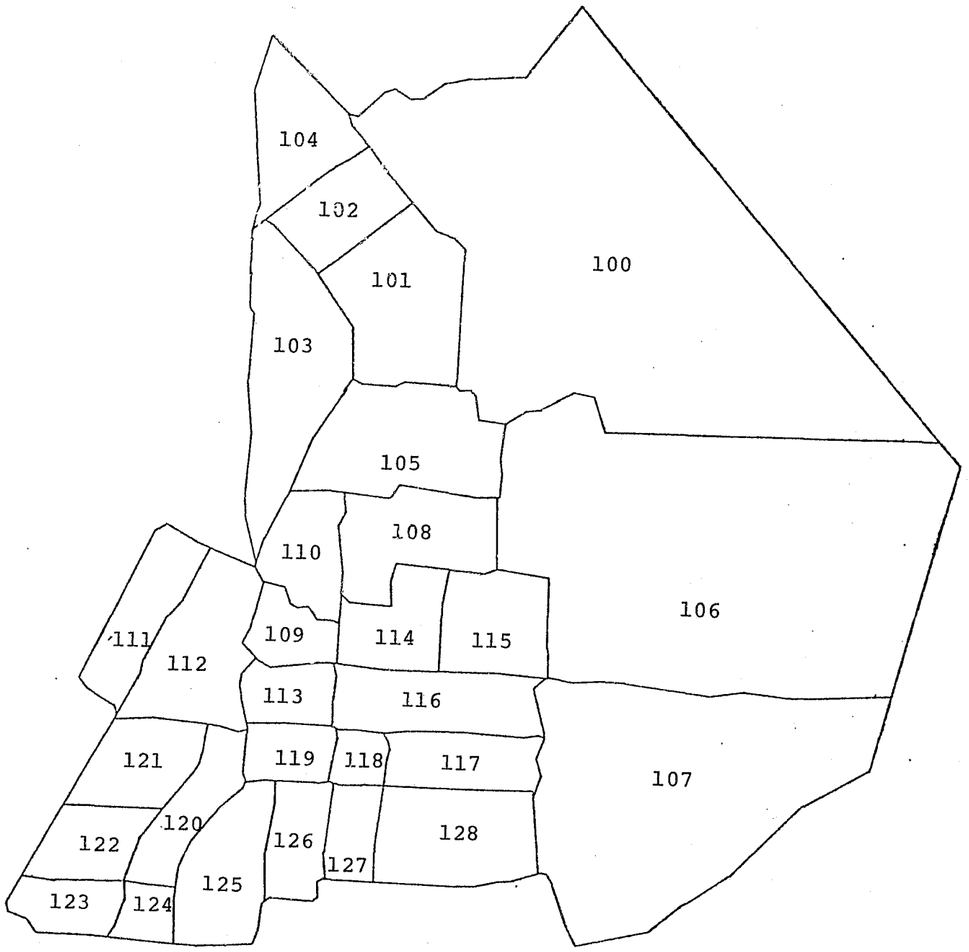

Figure 2-1

MAP OF LAW CITY

All calls received by the communications center are dispatched immediately if a patrol unit is available. If all patrol units are busy, the call for service is queued or "stacked" at the dispatching desk until a unit becomes available for another assignment. Queued calls are dispatched according to their importance using a three-level priority system. Calls that require immediate attention are classified as priority 1. Priority 1 calls in the queue are always dispatched before any priority 2 or 3 call. Priority 2 designates calls which require immediate police attention, but are not life-threatening or emergency situations. Priority 2 calls in the queue are always dispatched before any priority 3 calls, which represent work which can be delayed (e.g., completing a follow-up report). These calls are only dispatched when all priority 1 and 2 calls have been assigned.

Priority 1 calls for service are rarely stacked on the Day shift because of the availability of numerous backup units (e.g., detective and traffic units). As a result, when a priority 1 call is received on the Day shift and all patrol units are occupied, it is always possible to assign the call to a non-patrol unit. Other Day shift calls (i.e., priority 2 and 3) may be queued. On the Night and Afternoon shifts, backup units are usually not available and calls are queued if all patrol units are busy, regardless of the call's priority. Dispatchers at the communication center determine how many units to dispatch to each call based on the nature of the incident and the number of available units.

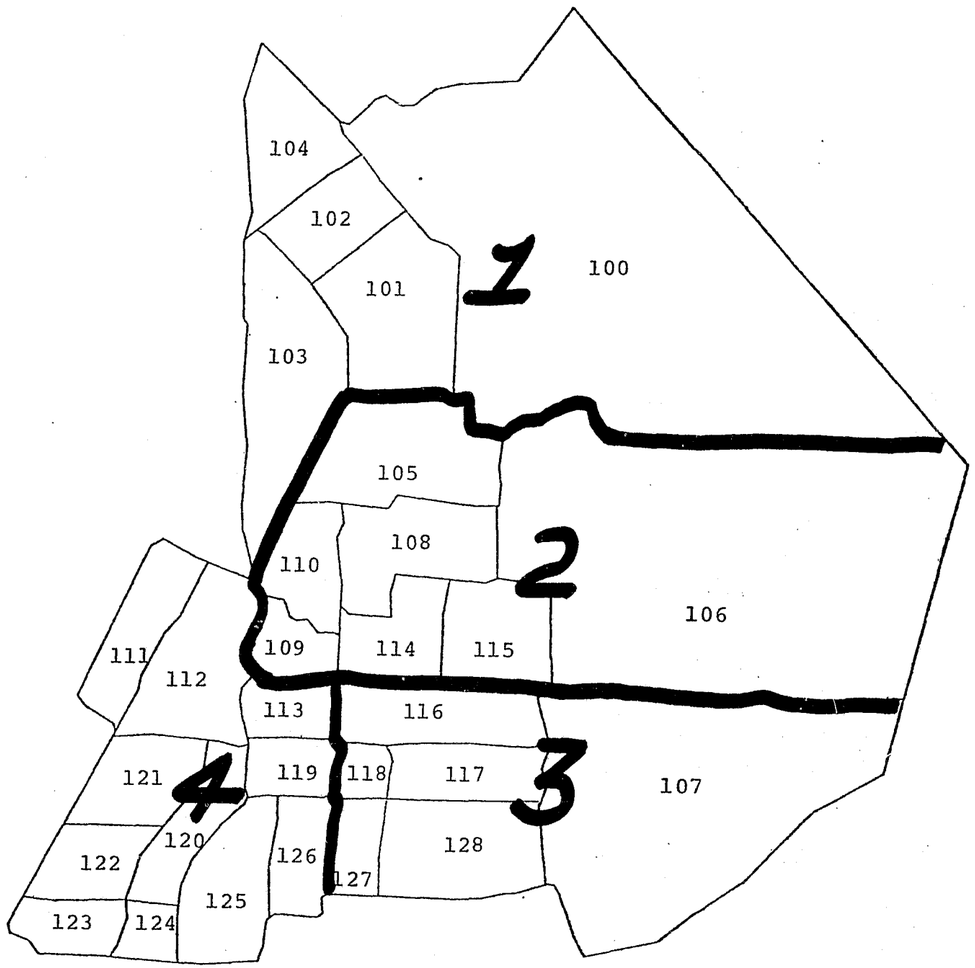

Figure 2-2

FOUR-BEAT STRUCTURE FOR LAW CITY

When units are not handling CFS or non-CFS assignments, they are directed to patrol within their assigned beats. A recent department study indicates that average patrol speeds differ considerably by shift. The study estimates that average patrol speed is 6.1 miles per hour on the Day shift, 8.2 miles per hour on the Afternoon shift, and 10.7 miles per hour on the Night shift.

C. Sample Data

To use BEAT/PLAN and PATROL/PLAN to analyze alternative patrol deployments in Law City, information must be collected about the size and workload of each reporting area, the dispatching policies of the department, and the average time spent on CFS and non-CFS work by patrol units. Some of the needed information is presented in the description of police operations in Section B.

The remaining information needed to complete the exercises can be obtained from dispatch tickets created for each CFS and non-CFS incident in Law City. A sample data set consisting of 390 dispatch tickets has been collected (see Appendix A). The 390 tickets represent a 10 percent sample (i.e., 1 out of every 10 tickets was included) selected during a 70-day (560 hours) period. The 70-day sample was obtained by randomly choosing 10 Mondays, 10 Tuesdays, etc. from 1978.

The specific data items collected from each dispatch ticket were:

1. Complaint number--a five digit number used to identify the incident.
2. Priority level--zero (0) indicates a non-CFS incident. All CFS incidents are identified with a 1, 2, or 3 entry.
3. Number of units dispatched--either 1, 2, or 3 units are dispatched to every incident.

4. Reporting area--identifies the location of the incident.

5. Time dispatched--time in military notation that the incident was assigned to the primary patrol unit. Missing times are denoted by a dash in Appendix A.

6. Time arrived--time in military notation that the primary patrol unit reported that it had arrived at the scene of the incident.

7. Time cleared--time in military notation that the primary patrol unit reported that it was available for another assignment.

8. Service time (2nd unit)--service time in minutes of the second unit dispatched. In Appendix A, a dash indicates either a missing time, or that a second unit was not dispatched.

9. Service time (3rd unit)--service time in minutes of the third unit dispatched to the incident. A dash indicates either a missing time, or that a third unit was not dispatched.

The procedures for deriving estimates of POLICE/PLAN inputs from a sample of dispatch data such as that shown in Appendix A are described in Appendix B.

CHAPTER III

DATA PREPARATION USING DATA/PLAN

A key element in the successful use of both PATROL/PLAN and BEAT/PLAN is the determination of input data items. For some data items, this may be a simple and straightforward process. For others, however, the extraction of reliable estimates from police records can be a major undertaking that requires a thorough understanding of the primary data sources available and the input data items required. A detailed discussion of the definition and use of these input data items can be found in the POLICE/PLAN user's manual. The exercises in this chapter illustrate the use of the DATA/PLAN program in determining some of these input data items. These exercises require the analysis of data files created using DATA/PLAN from the dispatch data in Appendix A. While not all program capabilities are utilized, the exercises do provide an introduction to the procedures involved in using DATA/PLAN.

The data in Appendix A consists of 390 dispatch tickets, representing a 10 percent sample of all such tickets generated during a 70-day period in 1978 (see Chapter II). Each dispatch record contains eight data items, plus an identifying number (the RECORD ID) used to refer to the record. The name assigned to each of the eight data items, and their minimum and maximum values are listed in Table 3-1. The complaint number shown in Appendix A is used as the RECORD ID.

Table 3-1

SUMMARY OF DATA ITEMS USED IN LAW CITY DISPATCH DATA FILES

Item Number	Item Name	Minimum Value	Maximum Value
1	PRIORITY	0	3
2	NO OF UNITS	1	3
3	AREA ID	100	128
4	DISP. TIME	0	2359
5	ARVD. TIME	0	2359
6	CLEAR TIME	0	2359
7	SRVC TIME-2	0	59
8	SRVC TIME-3	0	59

Several of the exercises below deal with the creation of data files from the dispatch data in Appendix A. Such files have been created previously, and are stored on the diskette containing the DATA/PLAN program.* Those parts of the exercises which deal with the creation of these files can therefore be bypassed by the user if desired.

*Records 1 through 20 in Appendix A are stored in the file named FILE #1. Records 21 through 94 are stored in the file named FILE #2. The files File #3, FILE #4, and FILE #5 contain records 95 through 233, 234 through 372, and 373 through 390, respectively.

Exercise 1: Use the DATA/PLAN program to create a data file containing the data items listed in Table 3-1 for records 1 through 20 in Appendix A. Verify that the data has been correctly entered, and save the file on disk.

Exercise 2: Use the DATA/PLAN program to create a data file containing records 21 through 94 listed in Appendix A. Verify that the data has been correctly entered, and save the file on disk. Based on the data in this file, tabulate the average travel time (i.e., the time interval between the time dispatched and the time arrived) for all calls (CFS and non-CFS).

Exercise 3: Based on records 1 through 94 (i.e., the data in the two files created in exercises 1 and 2), use DATA/PLAN to tabulate the average service time (i.e., the time interval between the time dispatched and the time cleared) by priority for calls on the Day shift.

Solutions to exercises 1, 2, and 3 are illustrated in Appendix C.

CHAPTER IV

PATROL CAR DEPLOYMENT ANALYSIS USING PATROL/PLAN

This chapter describes several exercises designed to give an introduction to the PATROL/PLAN program. Completion of the PATROL/PLAN exercises requires the use of many of the program's capabilities. It is assumed that the user is familiar with the procedures for using the program on an Apple II microcomputer, as described in the POLICE/PLAN user's manual.

Input data items needed to complete the PATROL/PLAN exercises are listed in Table 4-1.* This data was derived from the description of Law City in Chapter II and the sample dispatch data listed in Appendix A. Appendix B describes the procedures used to derive PATROL/PLAN input data for Law City.

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*Response speeds listed in Table 4-1 have been calibrated with the PATROL/PLAN program, using the average travel times extracted from the sample dispatch data. The response speed calibration procedure is described in the POLICE/PLAN user's manual.

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Table 4-1

PATROL/PLAN INPUTS BASED ON SAMPLE DATA FOR LAW CITY

Data Item	Night Shift	Day Shift	Afternoon Shift
No. of Response Units	4	4	4
Call Rate (CFS/Hour)	1.14	1.52	2.77
No. of Units Dispatched (% of calls):			
1 Unit	50.98	38.24	44.35
2 Units	41.18	51.47	40.32
3 Units	7.84	10.29	15.33
	100.00	100.00	100.00
Avg. Service Times (min.):			
1st Unit	24.71	41.89	39.78
2nd Unit	15.75	17.02	16.48
3rd Unit	6.75	6.71	8.42
Non-CFS Time (min./hour/unit)	2.02	3.16	6.86
Dispatch Policy:			
Option 1 (Backup Units For All CFS):		X	
Option 2 (Backup For Priority 1 Only):			X
Option 3 (No Backup Units):	X		
Priority Levels (% of calls):			
Priority 1:	23.53	16.18	24.19
Priority 2:	62.75	72.06	70.16
Priority 3:	13.72	11.76	5.65
	100.00	100.00	100.00
Region Area (square miles)	15.3	15.3	15.3
Response Speed (calibrated)	18.6	13.7	22.7
Patrolled Streets (miles)	323.4	323.4	323.4
Patrol Speed (mph)	10.7	6.1	8.2

Exercise 4: Use PATROL/PLAN and the input data in Table 4-1 to estimate the following performance characteristics for each shift in Law City.

- average number of units dispatched per CFS;
- average service time per CFS per unit;
- average service time per CFS;
- incoming work per unit;
- actual work per unit;
- uncommitted time per unit;
- average number of free units;
- probability of saturation or percent of time backup units are used;
- average patrol interval;
- average queue delay for priority 1, 2, and 3 calls;
- average travel time; and
- average response time for priority 1, 2, and 3 calls.

Exercise 5: Suppose that a study has been released, claiming that adequate police protection cannot be provided unless a department can meet the following hypothetical standards for patrol operations:

- Each unit has a minimum of 20 minutes per hour of uncommitted time.
- The probability that a call for service must be queued or assigned to a non-patrol unit is less than five percent.
- The patrol force can pass every location in its region at least once during each eight-hour shift.
- The average response time is less than five minutes.

a) Use PATROL/PLAN to determine how many additional patrol units would be needed on each shift to meet all of the standards specified above.

b) Identify which standard was the most difficult to satisfy on each shift.

c) Determine how many additional units would be needed on the Day shift if no backup units are used.

Exercise 6: The crime analysis team for the Law City Police Department has projected an 11.8 percent increase in the CFS rate for each shift due primarily to increased population in new subdivisions. A PATROL/PLAN analysis has shown that one additional patrol unit will be needed on each shift to maintain existing performance levels (i.e., the same uncommitted time, patrol interval, saturation probability, and average response time found in Exercise 4). This analysis also indicated that assigning an equal number of units to each shift results in an unequal distribution of work. In anticipation of a directive from the Chief's office to recommend new allocations by shift, perform the following analysis using PATROL/PLAN:

a) Allocate the 15 units over the three shifts based on the data shown in Table 4-1 and the increased call rates, using patrol interval time as the allocation variable. Allocate the units to minimize the patrol interval on each shift. Assume that no shift can lose units in the reallocation (i.e., units can only be added to the current levels).

b) Repeat the analysis described above, but assume that units can be added to or subtracted from current shift levels.

c) Repeat the analysis described in (b), but minimize overall average patrol interval.

The solutions to exercises 4, 5, and 6 are illustrated in Appendix D.

CHAPTER V

BEAT DESIGN AND ANALYSIS USING BEAT/PLAN

This chapter describes several exercises designed to give an introduction to the BEAT/PLAN program. It is assumed that the user is familiar with the procedures for using the program on an Apple II microcomputer, as described in the POLICE/PLAN user's manual.

The first step in analyzing alternative beat plans is to identify the beat-level statistics to be used in comparing alternative ways of combining reporting areas into patrol beats. In Law City, the following statistics are of interest:

- beat workload measured in terms of the total number of unit-minutes expended in responding to CFS incidents;
- beat size measured in square miles; and
- number of miles of patrolled streets in a beat.

In order to compute these beat-level statistics, the following data items are required for each reporting area:

- number of unit-minutes expended on each shift in responding to calls for service during the period of time represented in the data sample;
- square mile area; and
- number of miles of patrolled streets.

The values of these data items in each reporting area are summarized in Table 5-1.

In addition, use of BEAT/PLAN to suggest modifications to a specified beat plan and to compute non-additive performance characteristics requires input data identifying reporting area adjacencies and other geographic information. These inputs are

Table 5-1

REPORTING AREA DATA USED IN BEAT/PLAN ANALYSIS OF LAW CITY

Reporting Area	Area (Sq. Miles)	Patrolled Streets (Miles)	Unit-Minutes Spent Responding to Calls for Service		
			Night Shift	Day Shift	Afternoon Shift
100	3.83	31.7	99	106.2	200.8
101	0.54	18.6	66	159.3	150.6
102	0.25	9.1	33	106.2	200.8
103	0.60	21.2	165	371.7	602.4
104	0.29	10.2	33	106.2	100.4
105	0.48	13.1	0	159.3	50.2
106	2.83	25.5	0	106.2	50.2
107	1.72	21.0	0	0	200.8
108	0.40	17.7	0	0	200.8
109	0.21	6.0	0	212.4	301.2
110	0.22	8.0	165	53.1	301.2
111	0.27	7.9	33	0	351.4
112	0.35	13.6	0	212.4	251.0
113	0.17	5.7	66	265.5	301.2
114	0.24	10.8	132	106.2	100.4
115	0.29	7.6	66	53.1	50.2
116	0.25	11.0	66	212.4	150.6
117	0.22	6.0	66	106.2	150.6
118	0.06	2.5	99	53.1	200.8
119	0.17	5.9	66	265.5	200.8
120	0.19	8.6	66	212.4	150.6
121	0.21	6.9	33	318.6	351.4
122	0.19	8.3	0	53.1	100.4
123	0.16	4.6	66	53.1	150.6
124	0.11	4.1	66	0	100.4
125	0.37	10.3	0	53.1	0
126	0.17	6.3	231	159.3	401.6
127	0.13	4.4	33	53.1	351.4
128	0.38	16.8	33	53.1	502.0

discussed in detail in the BEAT/PLAN user's manual, and summarized in tables 5-2 and 5-3.

Several of the exercises which follow deal with the creation of data files containing the information described above. Such files have been created previously, and are stored on the diskette containing the BEAT/PLAN program.* The parts of the exercises below which deal with the creation of these files can therefore be bypassed by the user if desired.

*The file containing the reporting area data shown in Table 5-1 is named LAWCITY DATA. The file containing the reporting area adjacencies shown in Table 5-2 is named LAWCITY ADJ. The file containing the geographic data shown in Table 5-3 is name LAWCITY GEO DATA. The four-beat plan shown in Figure 2-2 is stored in the file named LAWCITY PLAN.

Table 5-2

REPORTING AREA ADJACENCY DATA
FOR LAW CITY

Reporting Area	Adjacent Reporting Areas
100	101 102 104 106
101	100 102 103 105
102	100 101 103 104
103	101 102 105 110
104	100 102
105	101 103 106 108 110
106	100 105 107 108 115
107	106 116 117 128
108	105 106 110 114 115
109	110 112 113 114
110	103 105 108 109
111	112
112	109 111 113 120 121
113	109 112 116 119
114	108 109 115 116
115	106 108 114 116
116	107 113 114 115 117 118
117	107 116 118 128
118	116 117 119 127
119	113 118 120 125 126
120	112 119 121 122 124 125
121	112 120 122
122	120 121 123
123	122 124
124	120 123 125
125	119 120 124 126
126	119 125 127
127	118 126 128
128	107 117 127

Table 5-3

GEOGRAPHIC DATA FOR REPORTING AREAS
IN LAW CITY

Reporting Area	Calls for Service	X-Coordinate	Y-Coordinate	Area (Square Miles)	Miles of Patrolled Streets
100	3	2.3485	1.3200	3.83	31.7
101	2	2.0020	1.5840	0.54	18.6
102	1	1.7655	1.1990	0.25	9.1
103	5	1.5675	1.8315	0.60	21.2
104	1	1.5675	0.8800	0.29	10.2
105	0	2.0515	2.1340	0.48	13.1
106	0	2.8545	2.5630	2.83	25.5
107	0	2.8490	3.5090	1.72	21.0
108	0	2.0790	2.5245	0.40	17.7
109	0	1.5675	2.9370	0.21	6.0
110	5	1.6390	2.5685	0.22	8.0
111	1	0.9790	2.8600	0.27	7.9
112	0	1.2320	2.9975	0.35	13.6
113	2	1.5895	3.1955	0.17	3.7
114	4	2.0295	2.9040	0.24	10.8
115	2	2.4255	2.8545	0.29	7.6
116	2	2.1945	3.2010	0.25	11.0
117	2	2.3210	3.4540	0.22	6.0
118	3	1.8865	3.4430	0.06	2.5
119	2	1.5895	3.4155	0.17	5.9
120	2	1.2155	3.6575	0.19	8.6
121	1	0.9790	3.4925	0.21	6.9
122	0	0.7975	3.8060	0.19	8.3
123	2	0.7370	4.0755	0.16	4.6
124	2	1.0395	4.1140	0.11	4.1
125	0	1.3640	3.8720	0.37	10.3
126	7	1.6335	3.7400	0.17	6.3
127	1	1.8590	3.7290	0.13	4.4
128	1	2.2660	3.7290	0.38	16.8

Exercise 7: Use the BEAT/PLAN program to create a data file containing the area, patrolled streets, and unit-minutes expended on calls for service on each shift for the 29 reporting areas in Law City (see Table 5-1). Verify that the data has been correctly entered and save the file on disk.

Exercise 8: Use the BEAT/PLAN program to define the current four-beat configuration for Law City (see Figure 2-2). Display the four-beat plan and verify that no reporting areas have been omitted or assigned to more than one beat. Save the beat plan on disk.

Exercise 9: Use the data file created in Exercise 7 and the beat plan specified in Exercise 8 to compute additive beat characteristics for the current four-beat plan.

Exercise 10: Enter reporting area adjacency data from the file LAWCITY ADJ. List the data and verify that it agrees with the adjacency data in Table 5-2. Use BEAT/PLAN's prescriptive capabilities to suggest modifications to the current four-beat plan to balance CFS workload by beat on the night shift. Display the additive beat characteristics for the new plan suggested by BEAT/PLAN.

Exercise 11: Enter the geographic data from the file LAWCITY GEO DATA. List the data and verify that it agrees with the data shown in Table 5-3. Use BEAT/PLAN to compute non-additive performance characteristics for the city, and for each unit and beat with the new beat plan produced in Exercise 10. Assume that the call rate is 1.14 calls per hour, that the average service time per call is 33 minutes, and that the average number of non-CFS minutes per hour per unit is 12 minutes. Assume also that calls arriving when all units are busy are queued, and that the unit assigned to the beat in which a call occurs is always dispatched if available. The average response speed and patrol speed are 18.6 and 10.7 miles per hour, respectively.

The solutions of exercises 7 through 11 are illustrated in Appendix E.

APPENDIX A

SAMPLE LAW CITY DISPATCH DATA

FILE #1

RECORD	COMP NO	PRIORITY LEVEL	NO OF UNITS	RPT AREA	DISP. TIME	ARVD. TIME	CLEAR TIME	SERVICE TIME - UNIT 2	SERVICE TIME - UNIT 3
1	02160	2	1	126	0506	0509	0517	-	-
2	17097	2	2	126	2013	2016	-	21	-
3	30801	2	2	128	1723	1726	-	17	-
4	33827	2	2	127	2307	2313	-	11	-
5	33806	2	2	127	1822	1826	1939	22	-
6	35234	1	3	127	1909	1913	2003	21	11
7	18550	1	2	126	2045	-	-	23	-
8	13809	0	1	126	2053	2057	2106	-	-
9	14280	2	2	126	1013	1019	1044	21	-
10	15699	2	2	128	2101	2103	2119	11	-
11	25292	1	2	128	2351	2356	0011	22	-
12	22738	2	2	126	2216	2245	2302	7	-
13	39071	2	1	128	1935	1938	2018	-	-
14	34387	2	1	128	1722	-	1754	-	-
15	01856	0	1	128	-	2358	0008	-	-
16	25792	3	1	128	2301	2331	2345	-	-
17	14894	2	1	128	-	-	-	-	-
18	28487	1	2	128	1607	-	-	13	-
19	30134	0	1	107	1659	1706	-	-	-
20	30238	2	2	107	1705	1711	1728	16	-

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FILE #2

RECORD	COMP NO	PRIORITY LEVEL	NO OF UNITS	RPT AREA	DISP. TIME	ARVD. TIME	CLEAR TIME	SERVICE TIME - UNIT 2	SERVICE TIME - UNIT 3
21	17625	1	2	101	-	1116	1118	6	-
22	16714	1	3	101	1257	1301	-	10	5
23	38573	2	1	101	2144	2149	2202	-	-
24	36906	1	2	101	2312	2317	2327	16	-
25	39664	2	1	101	2112	-	2142	-	-
26	00916	2	2	105	-	-	-	20	-
27	00082	2	1	105	1412	-	1418	-	-
28	00523	2	1	105	0829	0834	0852	-	-
29	34612	3	1	105	1542	1547	1604	-	-
30	30379	2	1	105	-	-	-	-	-
31	38448	2	2	105	2120	2129	2205	7	-
32	16895	0	1	105	2231	2236	2237	-	-
33	13348	0	1	105	2248	2253	2309	-	-
34	31519	0	1	105	2137	2156	2228	-	-
35	34477	2	2	106	1341	1354	1418	6	-
36	35088	0	1	106	0220	0225	0254	-	-
37	21782	2	1	106	2239	2241	0425	-	-
38	16835	0	1	106	1131	1136	1156	-	-
39	03955	2	2	106	1210	1214	1243	11	-
40	00253	2	1	106	-	1155	1220	-	-
41	16297	1	2	107	2340	2348	0015	25	-
42	17958	1	2	107	1737	1741	1751	0	-
43	31863	2	1	107	-	2336	0024	-	-
44	00772	2	1	107	2019	2029	2047	-	-
45	33814	2	1	108	1851	1858	1933	-	-
46	26481	2	1	108	-	-	0856	-	-
47	30862	0	1	108	0902	0904	0906	-	-
48	33682	2	2	108	-	-	1233	7	-
49	35706	2	2	108	2031	2044	2054	22	-
50	32845	2	2	108	2353	-	-	34	-
51	29514	3	2	108	1836	1838	-	10	-
52	21700	0	2	108	0325	0348	-	15	-
53	18678	0	1	108	2327	-	0007	-	-
54	04056	0	1	108	1332	1336	1346	-	-
55	02224	2	2	109	-	-	2115	18	-
56	16466	2	2	109	1215	1222	1315	25	-
57	16348	2	1	109	-	1439	1520	-	-
58	16282	3	1	109	2035	2038	2117	-	-
59	18023	0	1	109	0943	0945	0957	-	-
60	02305	2	1	109	1650	1654	-	-	-

FILE #2 (CONTINUED)

RECORD	COMP NO	PRIORITY LEVEL	NO OF UNITS	RPT AREA	DISP. TIME	ARVD. TIME	CLEAR TIME	SERVICE TIME - UNIT 2	SERVICE TIME - UNIT 3
61	23039	2	2	109	1427	-	-	4	-
62	15047	2	2	109	1340	1342	1353	27	-
63	32602	1	2	109	1506	-	1625	18	-
64	29774	2	1	109	1959	2001	2053	-	-
65	36700	0	2	109	2305	2312	2338	26	-
66	38093	0	1	109	1540	-	-	-	-
67	32929	2	1	109	2037	2045	-	-	-
68	31782	0	1	109	0122	0124	0200	-	-
69	31499	2	3	109	1906	1910	2043	28	15
70	32331	2	1	109	2004	2008	2107	-	-
71	25731	1	2	110	1300	1305	-	26	-
72	00143	0	1	110	-	1107	1114	-	-
73	36372	2	2	110	1751	-	1808	20	-
74	32270	1	3	110	0703	0706	0726	17	2
75	00751	2	1	110	1659	1703	1727	-	-
76	00193	2	1	110	1848	1848	1856	-	-
77	28721	1	2	110	-	-	1258	16	-
78	28738	1	2	110	1625	1627	1805	24	-
79	22509	2	2	110	0206	0206	0229	14	-
80	14098	1	2	110	1727	1736	2005	23	-
81	22614	2	1	110	-	2240	-	-	-
82	22887	3	1	110	0216	0219	0227	-	-
83	19800	2	1	110	0009	0012	-	-	-
84	19615	2	1	110	1629	1631	1638	-	-
85	03187	2	1	110	0158	-	0223	-	-
86	03395	0	1	110	-	-	0203	-	-
87	02711	2	1	111	1640	1645	-	-	-
88	19753	2	1	111	1805	1808	1827	-	-
89	15175	2	1	111	1741	1742	1745	-	-
90	15320	1	2	111	2141	2145	2150	29	-
91	01451	2	2	111	-	1101	1117	17	-
92	26117	3	1	111	-	-	1953	-	-
93	33660	1	2	111	-	-	-	14	-
94	00853	1	1	111	1813	1832	1837	-	-

FILE #3

RECORD	COMP NO	PRIORITY LEVEL	NO OF UNITS	RPT AREA	DISP. TIME	ARVD. TIME	CLEAR TIME	SERVICE TIME - UNIT 2	SERVICE TIME - UNIT 3
95	17373	2	1	100	0949	0958	1010	-	-
96	16222	1	2	100	0644	0652	0724	15	-
97	28206	2	2	100	0016	0025	0057	31	-
98	22933	2	1	100	1629	1632	1644	-	-
99	36309	1	2	100	0141	0147	0227	11	-
100	23190	1	3	100	2353	0004	0039	1	15
101	34179	2	3	100	2336	-	0013	15	4
102	33744	1	2	100	2318	2322	2351	18	-
103	03734	0	1	100	1233	1241	1248	-	-
104	38530	2	2	100	-	1258	1303	4	-
105	38073	2	2	100	-	-	1129	30	-
106	22386	2	2	100	0822	0829	1105	23	-
107	18499	0	1	100	1103	1109	1120	-	-
108	21248	2	2	101	0929	0957	-	24	-
109	14267	2	2	101	0615	0616	0630	9	-
110	16237	2	1	101	1210	1216	1309	-	-
111	15190	1	3	101	-	2143	2248	8	4
112	18237	0	1	101	1124	1129	1152	-	-
113	32462	1	2	101	0610	0610	0621	12	-
114	31210	0	1	101	2006	-	2050	-	-
115	28674	0	1	101	0239	0242	0253	-	-
116	28146	1	2	101	-	1326	-	11	-
117	02505	2	1	102	1655	-	-	-	-
118	34301	2	3	102	2338	2342	2344	-	14
119	35688	2	1	102	-	1655	1740	-	-
120	24462	2	1	102	1912	1919	2015	-	-
121	21035	3	1	102	1410	1421	1421	-	-
122	15745	2	3	102	1046	1052	1108	9	6
123	13668	2	1	102	1842	-	1947	-	-
124	14620	2	1	102	0523	0525	-	-	-
125	18421	0	1	102	2051	-	2141	-	-
126	18989	2	1	103	1902	-	1911	-	-
127	14283	2	3	103	1038	1042	1125	13	10
128	21390	2	2	103	1916	-	-	27	-
129	21478	2	1	103	1740	1746	1934	-	-
130	15126	2	2	103	1014	1017	1028	22	-
131	18068	2	1	103	1937	2019	2019	-	-
132	16484	1	2	103	1542	-	1622	5	-
133	32745	2	1	103	0242	0246	0300	-	-
134	32705	2	3	103	1732	1735	-	9	7

FILE #3 (CONTINUED)

RECORD	COMP NO	PRIORITY LEVEL	NO OF UNITS	RPT AREA	DISP. TIME	ARVD. TIME	CLEAR TIME	SERVICE TIME - UNIT 2	SERVICE TIME - UNIT 3
135	31964	2	2	103	-	-	0136	17	-
136	29993	0	1	103	-	0429	0512	-	-
137	35297	2	2	103	-	-	-	16	-
138	24206	2	2	103	1654	1655	1655	15	-
139	29403	1	2	103	-	1918	-	26	-
140	37088	0	1	103	1508	1512	1530	-	-
141	37007	2	2	103	-	-	2008	14	-
142	26654	2	2	103	2352	2357	0033	3	-
143	24221	1	3	103	1850	1852	2008	14	10
144	28389	0	1	103	1543	1551	1602	-	-
145	35646	0	1	103	1057	1103	-	-	-
146	28987	2	1	103	1953	-	2007	-	-
147	30945	0	1	103	0031	0038	0124	-	-
148	25809	3	1	103	0023	0055	-	-	-
149	36247	1	2	103	1113	-	1142	2	-
150	28176	0	1	103	1954	1957	2010	-	-
151	37251	2	1	103	0736	0743	0824	-	-
152	37272	2	1	103	1112	1119	1335	-	-
153	36163	2	1	103	1627	1634	1657	-	-
154	26376	2	2	103	1041	1045	1114	16	-
155	03062	2	1	103	0140	0143	-	-	-
156	01716	2	2	103	2127	2133	2141	24	-
157	01411	1	2	103	2331	2344	2358	21	-
158	39112	2	1	103	0147	-	0206	-	-
159	38866	2	2	103	1405	1407	1433	26	-
160	01756	0	1	103	-	0332	0339	-	-
161	20972	0	1	104	0003	-	0016	-	-
162	24631	2	2	104	0220	-	0256	6	-
163	29759	1	3	104	1813	1815	1829	14	8
164	25885	2	2	104	1954	2005	2005	29	-
165	16594	0	2	104	1436	1441	1452	11	-
166	16654	0	1	104	2252	2253	-	-	-
167	14939	2	1	104	1427	1428	1433	-	-
168	20911	2	1	104	1410	-	-	-	-
169	27152	2	2	113	1629	1630	1639	22	-
170	03415	0	1	113	-	1051	1100	-	-
171	03522	2	1	113	-	-	-	-	-
172	36845	0	1	113	1415	1416	-	-	-
173	32024	1	1	113	1901	1902	1919	-	-
174	36660	3	1	113	1507	1514	1532	-	-

FILE #3 (CONTINUED)

RECORD	COMP NO	PRIORITY LEVEL	NO OF UNITS	RPT AREA	DISP. TIME	ARVD. TIME	CLEAR TIME	SERVICE TIME - UNIT 2	SERVICE TIME - UNIT 3
175	26715	1	3	112	1706	-	1743	15	9
176	35792	2	2	112	1502	1527	1548	24	-
177	27576	2	1	112	0917	-	0932	-	-
178	30904	2	3	112	1811	1811	2010	13	8
179	00544	2	1	112	-	1355	1359	-	-
180	27666	1	2	112	-	0307	0325	9	-
181	15305	2	1	112	1940	1947	2002	-	-
182	23175	2	3	112	-	-	2150	15	6
183	20064	0	1	112	0022	0032	0043	-	-
184	19126	0	1	112	1830	1835	1857	-	-
185	02957	2	2	111	0521	0523	0529	19	-
186	02753	2	2	111	2357	-	0002	8	-
187	01310	2	2	111	2223	2243	2257	10	-
188	27274	2	1	112	1254	-	1334	-	-
189	16775	1	3	112	2023	2027	2040	5	13
190	20786	2	2	112	1357	1403	1451	20	-
191	15260	0	1	112	1147	1149	1203	-	-
192	14233	2	1	112	2029	-	2043	-	-
193	26102	3	1	113	1800	1805	1825	-	-
194	21142	2	3	113	1326	-	1409	16	8
195	21467	2	1	113	1205	1211	-	-	-
196	22280	3	1	113	0949	-	0956	-	-
197	22584	3	2	113	1817	-	-	22	-
198	13588	2	2	113	2357	0025	0029	13	-
199	02611	1	1	113	1607	1609	1611	-	-
200	29358	1	3	113	0949	-	0952	17	6
201	01061	3	1	113	-	-	1816	-	-
202	37792	0	1	113	1320	1328	1418	-	-
203	01897	2	3	113	-	-	-	20	7
204	02999	0	1	113	1539	-	1633	-	-
205	01876	2	1	113	0749	0750	0757	-	-
206	03146	1	2	113	-	-	1906	16	-
207	39498	0	1	113	-	1233	1405	-	-
208	33641	0	1	113	2223	2225	2230	-	-
209	29575	1	2	119	-	0257	0311	4	-
210	32084	0	1	119	-	-	1138	-	-
211	30013	1	3	119	1310	-	1332	4	9
212	35318	0	1	119	-	-	1530	-	-
213	30597	2	1	119	-	1333	1346	-	-
214	35338	2	2	119	1726	1728	1753	11	-

FILE #3 (CONTINUED)

RECORD	COMP NO	PRIORITY LEVEL	NO OF UNITS	RPT AREA	DISP. TIME	ARVD. TIME	CLEAR TIME	SERVICE TIME - UNIT 2	SERVICE TIME - UNIT 3
215	36804	2	1	113	-	-	-	-	-
216	03914	2	1	113	-	-	0042	-	-
217	04015	2	2	113	0316	0317	0322	17	-
218	32125	2	1	114	2041	2046	2059	-	-
219	03279	1	3	114	0007	0012	0045	27	7
220	37750	3	1	114	0118	0122	0131	-	-
221	22692	0	1	114	1600	-	1636	-	-
222	13274	0	1	114	0855	0902	0950	-	-
223	23416	2	2	114	-	2354	2357	-	-
224	19330	3	1	114	0506	0515	-	-	-
225	19738	2	3	114	1619	1637	1709	11	2
226	20880	2	2	114	0849	0857	0857	32	-
227	29108	3	1	114	-	0017	0028	-	-
228	31169	2	2	114	0506	0512	0530	15	-
229	29699	2	2	115	0214	0220	0355	14	-
230	20318	0	1	115	1542	1546	1555	-	-
231	23115	3	1	115	1021	1031	1038	-	-
232	13249	2	1	115	2039	2046	2116	-	-
233	35504	2	3	115	0112	-	0139	9	9

FILE #4

RECORD	COMP NO	PRIORITY LEVEL	NO OF UNITS	RPT AREA	DISP. TIME	ARVD. TIME	CLEAR TIME	SERVICE TIME - UNIT 2	SERVICE TIME - UNIT 3
234	37048	1	2	117	0236	0241	0345	15	-
235	18633	2	2	117	-	-	-	5	-
236	22310	2	2	117	1637	-	-	18	-
237	16624	2	1	117	2025	-	2033	-	-
238	23130	0	1	117	1333	1342	-	-	-
239	24009	2	1	117	1001	1007	1117	-	-
240	12874	2	2	117	-	1208	1212	18	-
241	25201	2	1	117	0134	0135	0154	-	-
242	02691	2	1	117	1302	1308	1312	-	-
243	36453	0	1	117	-	-	1541	-	-
244	37190	2	1	117	1650	1659	1742	-	-
245	36023	2	2	118	2304	2306	2316	11	-
246	35895	2	2	118	1715	1742	1742	17	-
247	36576	2	3	118	1750	1753	1825	10	6
248	35626	1	3	116	0304	0307	0341	13	9
249	25185	2	1	118	2229	2245	2321	-	-
250	17768	0	1	118	-	-	1838	-	-
251	16805	2	1	118	0248	0250	0307	-	-
252	21591	2	2	118	1247	1254	-	19	-
253	15335	1	2	118	-	-	-	9	-
254	14999	2	2	118	0106	0117	0121	9	-
255	24251	1	3	119	2258	2302	2323	23	8
256	27365	0	1	119	-	-	0730	-	-
257	21435	2	1	119	0318	0322	0342	-	-
258	27289	1	2	119	1623	1628	1631	-	-
259	17242	0	1	119	-	-	0436	-	-
260	17143	2	2	119	1052	1106	-	25	-
261	17924	2	2	119	1222	1236	1244	22	-
262	25124	2	2	119	1143	1156	1421	-	-
263	25526	2	2	119	0918	0921	0926	7	-
264	19360	0	1	119	1331	-	1351	-	-
265	13140	3	1	119	1719	1721	-	-	-
266	00313	1	2	119	0114	0117	0125	20	-
267	34716	2	1	119	-	1501	1523	-	-
268	30094	0	1	115	0647	0653	0703	-	-
269	21127	2	2	114	1106	1109	1207	16	-
270	14174	2	2	116	1131	1137	1326	5	-
271	24738	2	1	116	2317	2319	-	-	-
272	17273	2	2	116	1203	1209	1319	12	-
273	01226	2	1	116	0532	0535	-	-	-

FILE #4 (CONTINUED)

RECORD	COMP NO	PRIORITY LEVEL	NO OF UNITS	RPT AREA	DISP. TIME	ARVD. TIME	CLEAR TIME	SERVICE TIME - UNIT 2	SERVICE TIME - UNIT 3
274	02631	2	3	121	1826	-	-	30	4
275	37517	2	1	121	2255	2259	2304	-	-
276	03039	0	1	121	2307	2308	2330	-	-
277	37687	0	1	121	-	1211	1239	-	-
278	37832	0	1	122	-	-	2302	-	-
279	39539	0	1	122	1712	1718	1737	-	-
280	34944	0	1	122	-	-	1425	-	-
281	27757	1	2	122	-	-	-	26	-
282	20442	1	2	122	1802	1810	2011	14	-
283	23949	0	1	122	2124	2130	2324	-	-
284	25370	1	2	122	1757	1803	1832	20	-
285	15561	3	1	122	1231	1233	1243	-	-
286	15869	2	2	123	-	-	1116	3	-
287	14984	0	1	123	2145	2158	2221	-	-
288	13589	0	1	123	-	0003	0045	-	-
289	28342	1	2	123	0129	0133	0140	25	-
290	26870	1	3	123	2343	2350	2355	16	6
291	17640	2	1	123	1343	1347	1356	-	-
292	16669	0	1	123	0348	0355	0418	-	-
293	23314	0	1	123	0401	0404	0418	-	-
294	34633	2	2	123	1855	1903	1951	24	-
295	31883	2	1	123	0225	0231	0247	-	-
296	33114	2	1	123	1749	-	1809	-	-
297	33540	2	1	124	0543	0548	0628	-	-
298	13032	0	1	124	1742	1749	1803	-	-
299	23431	2	2	124	0242	0245	0258	-	-
300	28076	2	1	124	2148	2152	2203	-	-
301	19049	0	1	124	0255	0311	0336	-	-
302	29373	2	1	124	-	1253	1300	-	-
303	27058	2	1	124	2028	2033	2119	-	-
304	21843	2	2	125	-	-	1838	11	-
305	30576	2	1	125	0850	0859	-	-	-
306	17863	0	1	125	-	-	-	-	-
307	13321	0	1	125	1801	1802	1825	-	-
308	36742	2	1	125	-	-	1442	-	-
309	32393	1	2	125	-	1535	1557	5	-
310	03176	1	2	126	-	2339	-	33	-
311	03166	2	2	126	2208	2214	2307	18	-
312	33970	1	2	126	0611	0615	0620	28	-
313	34408	2	2	126	1921	1922	1929	4	-

FILE #4 (CONTINUED)

RECORD	COMP NO	PRIORITY LEVEL	NO OF UNITS	RPT AREA	DISP. TIME	ARVD. TIME	CLEAR TIME	SERVICE TIME - UNIT 2	SERVICE TIME - UNIT 3
314	00896	2	2	126	0034	-	0040	17	-
315	37726	2	2	126	2144	2146	2218	34	-
316	13291	2	2	126	-	-	-	11	-
317	13095	1	3	126	-	0405	-	16	6
318	35380	3	1	126	0120	0123	0134	-	-
319	17545	0	1	126	1734	1740	1827	-	-
320	30883	2	3	126	1336	1341	-	15	3
321	35729	2	1	126	0020	0022	0048	-	-
322	31007	0	1	126	1828	1832	2148	-	-
323	23405	2	1	126	2227	2232	2243	-	-
324	17114	2	1	126	2329	2331	2341	-	-
325	17303	2	2	126	1817	1818	-	11	-
326	19693	2	1	126	0043	0059	-	-	-
327	29156	2	2	126	1353	1357	1441	22	-
328	19172	2	1	126	0029	-	0048	-	-
329	20234	2	1	126	1904	-	1932	-	-
330	18958	0	1	126	1348	1353	1418	-	-
331	14523	2	1	126	1139	1142	1143	-	-
332	14725	0	1	126	1026	1028	1052	-	-
333	29933	2	3	126	-	1519	1608	24	5
334	29434	3	1	126	2355	2359	0535	-	-
335	15501	0	1	126	2027	2031	2037	-	-
336	36926	3	1	126	0426	-	0427	-	-
337	36987	2	1	126	-	1648	-	-	-
338	21451	1	2	127	0948	0955	1056	19	-
339	25991	2	2	127	1912	1915	2001	18	-
340	23904	0	1	127	1400	1400	-	-	-
341	18616	0	1	127	1718	1720	1720	-	-
342	26746	2	1	127	2219	-	-	-	-
343	20140	2	1	127	2208	2217	2226	-	-
344	24071	0	1	127	2102	2106	2118	-	-
345	18176	1	3	127	1907	1910	1926	15	0
346	33174	1	2	127	-	0140	0143	17	-
347	01736	1	2	127	0023	-	0056	22	-
348	00792	3	1	116	0158	0201	0242	-	-
349	26132	0	1	116	2249	-	2307	-	-
350	23069	2	2	116	2130	2137	2212	13	-
351	19004	0	1	116	2117	2128	2137	-	-
352	35004	0	1	116	0835	0838	0846	-	-
353	00832	2	2	116	1505	1548	1553	13	-

FILE #4 (CONTINUED)

RECORD	COMP NO	PRIORITY LEVEL	NO OF UNITS	RPT AREA	DISP. TIME	ARVD. TIME	CLEAR TIME	SERVICE TIME - UNIT 2	SERVICE TIME - UNIT 3
354	01816	1	3	119	-	1639	1644	24	2
355	33888	0	1	119	-	1507	-	-	-
356	02080	2	1	119	-	-	-	-	-
357	38282	2	3	119	-	-	1409	21	6
358	38216	1	3	120	2144	2147	2154	13	11
359	01185	1	2	120	1557	1606	-	13	-
360	36412	2	2	120	0741	0754	-	10	-
361	37436	1	2	120	2139	2145	2235	16	-
362	33520	2	2	120	2301	2304	2308	7	-
363	35956	2	1	119	-	1326	1330	-	-
364	26669	1	2	120	0234	0236	0239	3	-
365	29033	2	2	120	0803	0809	0951	13	-
366	26684	2	1	120	1043	1046	1232	-	-
367	21747	2	1	120	1509	1519	1519	-	-
368	15546	1	2	121	0829	0834	0858	31	-
369	15441	2	1	121	0938	0942	1011	-	-
370	23344	3	1	121	1357	-	1434	-	-
371	29638	2	1	121	1801	-	1844	-	-
372	28358	2	2	121	0814	0827	-	26	-

FILE #5

RECORD	COMP NO	PRIORITY LEVEL	NO OF UNITS	RPT AREA	DISP. TIME	ARVD. TIME	CLEAR TIME	SERVICE TIME - UNIT 2	SERVICE TIME - UNIT 3
373	14909	1	2	121	0845	0850	0916	28	-
374	26806	2	2	121	-	1221	1354	20	-
375	27956	2	1	121	1959	2012	2012	-	-
376	29123	2	1	121	0212	-	-	-	-
377	28031	2	2	121	-	-	-	12	-
378	20472	1	3	121	2234	2238	2308	9	9
379	17332	0	1	121	2320	2324	2359	-	-
380	17159	0	1	121	1442	-	-	-	-
381	18128	2	2	121	-	1011	-	11	-
382	28161	0	1	121	1616	1622	1657	-	-
383	03794	0	1	121	0046	0049	0114	-	-
384	37394	3	1	121	1525	-	1542	-	-
385	37129	0	1	121	1241	1243	1251	-	-
386	37599	2	1	121	1937	1940	1945	-	-
387	13647	2	1	121	1620	1623	1654	-	-
388	35148	1	2	116	1757	1759	1839	21	-
389	04144	2	2	116	1042	1044	1135	11	-
390	34054	3	1	116	-	2107	-	-	-

APPENDIX B

DETERMINATION OF POLICE/PLAN INPUT ITEMS FROM DISPATCH DATA

To use PATROL/PLAN, the following data must be obtained from dispatch data for each time period and region of interest:

- average call rate--the average number of calls for service per hour;
- percent of calls that require exactly one unit, exactly two units, and so on;
- average service time in minutes for the first unit dispatched, the second unit dispatched, and so on;
- average number of minutes of non-CFS activity per hour for each patrol unit;
- percent of calls for service that are classified as priority 1, 2, and 3; and
- average speed of the patrol units when responding to a call for service.

To use BEAT/PLAN, dispatch data is used to determine the relative CFS workload in each reporting area in the region for the time period of interest. Two measures of relative reporting area workload that can be used are:

- number of calls for service in each reporting area; and
- total service minutes spent on calls for service in each reporting area.

This appendix discusses how these data items for PATROL/PLAN and BEAT/PLAN can be obtained from typical dispatch data such as that shown in Appendix A.*

*Other data items needed to use PATROL/PLAN and BEAT/PLAN (e.g., number of units, dispatch option, square-mile area of the region and each reporting area, number of miles of patrolled streets, and patrol speed) must be obtained from sources other than dispatch data (see the POLICE/PLAN user's manual).

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Adjusting Input Values to Account for Sampling and Missing Data

When the dispatch data being used to estimate POLICE/PLAN input items represents a sample of all such data, or when entries for some items in the dispatch records are missing, adjustments must be made to some input values to account for this sampling and missing data. These adjustments are based on (1) the selection percent (2) the missing percent, and (3) the sampling percent.

Selection percent. The selection percent is the percent of the dispatch records which were selected in the sample. For example, the selection percent for the dispatch data in Appendix A is 10 since one of every 10 records was included in the sample.

Missing percent. The missing percent is the percent of records in the sample which are missing one or more necessary dispatch data items. For example, the shift indicator is a necessary data item in determining the average call rate by shift. If the shift cannot be determined for one of every 10 records, the missing percent used in computing average call rates is 10. Necessary dispatch data items for each POLICE/PLAN input value are identified below.*

Sampling percent. The sampling percent for a set of data is based on the selection percent and the missing percent, and is computed using formula (B-1).** For example, if the selection

*Note that since the necessary dispatch data items are different for each POLICE/PLAN input value, the missing percent will, in general, also be different. Since the sampling percent depends on the missing percent, it too will be different for each POLICE/PLAN input value.

**Formulas used in this appendix are summarized in Figure B-1.

$$\left(\begin{matrix}\text{sampling}\\ \text{percent}\end{matrix}\right) = .01 \times \left(\begin{matrix}\text{selection}\\ \text{percent}\end{matrix}\right) \times \left[100 - \left(\begin{matrix}\text{missing}\\ \text{percent}\end{matrix}\right)\right] \quad \text{(B-1)}$$

$$\left(\begin{matrix}\text{average}\\ \text{call rate}\end{matrix}\right) = \frac{100 \times \left(\begin{matrix}\text{number of}\\ \text{CFS incidents}\end{matrix}\right)}{\left(\begin{matrix}\text{sampling}\\ \text{percent}\end{matrix}\right) \times \left(\begin{matrix}\text{number of}\\ \text{hours represented}\\ \text{by sample}\end{matrix}\right)} \quad \text{(B-2)}$$

$$\left(\begin{matrix}\text{percent of}\\ \text{calls requiring}\\ \text{exactly N units}\end{matrix}\right) = \frac{100 \times \left(\begin{matrix}\text{number of}\\ \text{CFS requiring}\\ \text{exactly N units}\end{matrix}\right)}{\left(\begin{matrix}\text{number of}\\ \text{CFS incidents}\end{matrix}\right)} \quad \text{(B-3)}$$

$$\left(\begin{matrix}\text{average}\\ \text{service time}\\ \text{for Nth unit}\end{matrix}\right) = \frac{\left(\begin{matrix}\text{total}\\ \text{service time}\\ \text{for Nth unit}\end{matrix}\right)}{\left(\begin{matrix}\text{number of CFS}\\ \text{with known}\\ \text{service time}\\ \text{for Nth unit}\end{matrix}\right)} \quad \text{(B-4)}$$

$$\left(\begin{matrix}\text{average}\\ \text{non-CFS minutes}\\ \text{per hour}\end{matrix}\right) = \frac{100 \times \left(\begin{matrix}\text{total non-}\\ \text{CFS minutes}\end{matrix}\right)}{\left(\begin{matrix}\text{sampling}\\ \text{percent}\end{matrix}\right) \times \left(\begin{matrix}\text{number of}\\ \text{sample hours}\end{matrix}\right)} \quad \text{(B-5)}$$

$$\left(\begin{matrix}\text{average}\\ \text{non-CFS minutes}\\ \text{per hour per unit}\end{matrix}\right) = \frac{\left(\begin{matrix}\text{average}\\ \text{non-CFS minutes}\\ \text{per hour}\end{matrix}\right)}{\left(\begin{matrix}\text{average}\\ \text{number of units}\\ \text{fielded per hour}\end{matrix}\right)} \quad \text{(B-6)}$$

$$\left(\begin{matrix}\text{percent of}\\ \text{CFS in}\\ \text{priority level P}\end{matrix}\right) = \frac{100 \times \left(\begin{matrix}\text{number of}\\ \text{CFS in}\\ \text{priority level P}\end{matrix}\right)}{\left(\begin{matrix}\text{number}\\ \text{of CFS}\end{matrix}\right)} \quad \text{(B-7)}$$

$$\left(\begin{matrix}\text{average}\\ \text{travel time}\end{matrix}\right) = \frac{\left(\begin{matrix}\text{total}\\ \text{travel time}\\ \text{to CFS incidents}\end{matrix}\right)}{\left(\begin{matrix}\text{number of CFS}\\ \text{incidents with known}\\ \text{travel time}\end{matrix}\right)} \quad \text{(B-8)}$$

Figure B-1

FORMULAS USED TO ESTIMATE POLICE/PLAN INPUT ITEMS FROM DISPATCH DATA

percent is 10 and the missing percent is 10, the sampling percent is:

$$\begin{pmatrix}\text{sampling}\\ \text{percent}\end{pmatrix} = \frac{(10) \times (100 - 10)}{100}$$

$$= 9.0 \text{ percent.}$$

Estimating POLICE/PLAN Input Items

The procedure for estimating each POLICE/PLAN input item from dispatch data is discussed below and illustrated for the data in Appendix A. Table B-1 summarizes the results of tabulating the 390 dispatch tickets (e.g., using DATA/PLAN).

Average call rate. The average number of calls for service per hour for each block can be estimated by (1) counting the total number of CFS incidents (i.e., excluding all non-CFS incidents) received for each block in the sample data, (2) dividing this count by the total number of hours represented in the sample, and (3) inflating the result based on the sampling percent discussed above (see formula (B-2)). For example, of 304 (F5*) CFS incidents in the sample, 51 (F1) occurred on the Night shift. Since the data item used to indicate the shift (i.e., time dispatched) is missing for 61 (F4) incidents, the missing percent is:

$$\begin{pmatrix}\text{missing}\\ \text{percent}\end{pmatrix} = \frac{100 \times F4}{F5}$$

$$= \frac{100 \times 61}{304}$$

$$= 20.07 \text{ percent}$$

*The notation used refers to labels used to identify entries in Table B-1.

Table B-1

RESULTS OF TABULATING DISPATCH DATA IN APPENDIX A

Priority Level:	Priority 1	Priority 2	Priority 3	Total
Number of Calls for Service				
Night Shift	A1: 12	A2: 32	A3: 7	A4: 51
Day Shift	11	49	8	68
Afternoon Shift	30	87	7	124

Number of Units Dispatched:	1 Unit	Unit 2	Unit 3	Total
Number of Calls for Service				
Night Shift	B1: 26	B2: 21	B3: 4	B4: 51
Day Shift	26	35	7	68
Afternoon Shift	55	50	19	124

Unit Dispatched:	1st Unit		2nd Unit		3rd Unit	
	Number of CFS	Service Time	Number of CFS	Service Time	Number of CFS	Service Time
Night Shift	C1: 42	C2:1038	24	378	4	27
Day Shift	56	2346	41	698	7	47
Afternoon Shift	104	4137	67	1104	19	160

Shift:	Night Shift	Day Shift	Afternoon Shift
Number of Calls for Service	D1: 42	54	101
Total Travel Time	D2:209	413	649

Shift:	Night	Day	Afternoon	Missing	Total
Number of Calls for Service	F1: 51	F2: 68	F3: 124	F4: 61	F5:304

	Non-CFS Incidents with One Unit Dispatched		Non-CFS Incidents with Two Units Dispatched		
	Number of Incidents	Number of Minutes	Number of Incidents	Number of Minutes - Unit 1	Number of Minutes - Unit 2
Night Shift	G1: 11	H1: 305	G5: 0	H4: 0	H5: 0
Day Shift	G2: 19	H2: 451	G6: 1	H6: 16	H7: 11
Afternoon Shift	G3: 26	H3: 961	G7: 1	H8: 33	H9: 23
Missing	G4: 27		G8: 1		

the sampling percent is:

$$\begin{pmatrix}\text{sampling}\\ \text{percent}\end{pmatrix} = \frac{10 \times (100 - 20.07)}{100}$$

$$= 7.99 \text{ percent,}$$

and the average call rate for the Night shift is:

$$\begin{pmatrix}\text{average}\\ \text{call rate}\end{pmatrix} = \frac{100 \times 51}{7.99 \times 560}$$

$$= 1.14 \text{ calls per hour.}$$

Percent of calls that require exactly N units. The percent of calls that require exactly N units can be estimated by (1) counting the number of CFS incidents to which exactly N units were dispatched, (2) dividing by the total number of CFS incidents in the sample for the block, and (3) multiplying by 100 (see formula (B-3)). No adjustment to the result is needed to account for sampling or missing data.* For example, one unit was dispatched to 26 (B1) of 51 (B4) CFS incidents on the Night shift. Therefore, the percent of calls that require exactly one unit is:

$$\begin{pmatrix}\text{percent of}\\ \text{calls requiring}\\ \text{exactly 1 unit}\end{pmatrix} = \frac{100 \times B1}{B4}$$

$$= \frac{100 \times 26}{51}$$

$$= 50.98 \text{ percent.}$$

*In general, adjustments to account for sampling or missing data are not necessary when estimating percentages of incidents or averages per incident, but are required when estimating averages per hour or block.

Average service time for the Nth unit dispatched. The average service time for the Nth unit dispatched to a CFS incident for a block can be estimated by (1) summing the total service times for the Nth unit for that block and dividing by the number of CFS records for the block for which the Nth unit's service time is known (see formula (B-4)). No adjustment to the result is needed to account for sampling or missing data. For example, a service time could be determined for the first unit dispatched (i.e., N = 1) in 42 (C1) CFS records for the Night shift. The sum of these 42 service times is 1,038 (C2) minutes. Therefore, the average service time for the first unit dispatched is:

$$\begin{pmatrix}\text{average}\\ \text{service time}\\ \text{for first unit}\end{pmatrix} = \frac{C2}{C1}$$

$$= \frac{1038}{42}$$

$$= 24.71 \text{ minutes.}$$

Average non-CFS minutes per hour per unit. The average number of non-CFS minutes per hour for a block can be estimated by (1) summing the total time consumed in the block by all units for non-CFS activities, (2) dividing by the number of hours in the sample, and (3) adjusting the result to account for sampling and missing data (see formula (B-5)). The missing percent used to calculate the sampling percent is based on the number of records for which one or more of the data items used to determine the block of the incident, whether the record was a CFS or non-CFS incident, or the service time of each unit assigned to the incident, is missing. For example, one or more of these data items is

missing in 28 (G4 + G8) of 86 (G1 + G2 + ...+ G8) non-CFS incidents. Therefore, the missing percent is:

$$\begin{pmatrix}\text{missing}\\ \text{percent}\end{pmatrix} = \frac{100 \times 28}{86}$$

$$= 32.56 \text{ percent,}$$

and the sampling percent is:

$$\begin{pmatrix}\text{sampling}\\ \text{percent}\end{pmatrix} = \frac{10 \times (100 - 32.56)}{100}$$

$$= 6.74 \text{ percent.}$$

The total non-CFS minutes for the remaining records for the Night shift is 305 minutes (H1 + H4 + H5) and the number of sample hours is 560. Therefore, the average non-CFS minutes per hour is:

$$\begin{pmatrix}\text{average}\\ \text{non-CFS minutes}\\ \text{per hour}\end{pmatrix} = \frac{100 \times 305}{6.74 \times 560}$$

$$= 8.08 \text{ minutes.}$$

To determine the average non-CFS minutes per hour per unit, this result is divided by the average number of units fielded per hour (see formula (B-6)). The latter can be determined by summing the number of units fielded per hour in the sample period and dividing by the total number of hours. In Law City, for example, four units were fielded at all times, and the average non-CFS minutes per hour per unit is:

$$\begin{pmatrix}\text{average}\\ \text{non-CFS minutes}\\ \text{per hour per unit}\end{pmatrix} = \frac{8.08}{4}$$

$$= 2.02 \text{ minutes.}$$

Percent of CFS in each priority level. The percent of CFS in each priority level for a block can be estimated by (1) counting the number of CFS in each priority level for that block, (2) multiplying by 100, and (3) dividing by the total number of CFS for the block (see formula (B-7)). No adjustment is needed to account for sampling or missing data. On the Night shift, for example, 12 (A1) of 51 (A4) CFS incidents were priority 1. Therefore, the percent of CFS in priority level 1 is:

$$\begin{pmatrix}\text{percent of}\\ \text{CFS which}\\ \text{are priority 1}\end{pmatrix} = \frac{100 \times 12}{51}$$

$$= 23.53 \text{ percent.}$$

Average response speed. Average travel time estimates for a block can be used to estimate average response speeds (see the PATROL/PLAN user's manual). Average travel time can be estimated by (1) summing travel times to each CFS incident for a block, and (2) dividing by the number of CFS incidents for that block for which a travel time can be determined (see formula (B-8)). No adjustment for sampling or missing data is needed. For example, the travel times to 42 (D1) CFS incidents on the Night shift totalled 209 (D2) minutes. Therefore, the average travel time is:

$$\begin{pmatrix}\text{average}\\ \text{travel time}\end{pmatrix} = \frac{209}{42}$$

$$= 4.98 \text{ minutes.}$$

Number of calls for service in each reporting area. CFS totals for each reporting area can be obtained by counting the number of CFS incidents in each reporting area for each block. No adjustment for sampling or missing data is needed since only the relative

distribution of calls by reporting area is of interest. This measure of relative workload is recommended when the number of CFS incidents per reporting area is small.

Total service minutes in each reporting area. Relative reporting area workloads based on total service minutes can be estimated by determining the total number of service minutes for CFS incidents in each reporting area for each block. No adjustment for sampling or missing data is needed since only the relative distribution of service minutes by reporting area is of interest This measure of relative workload should not be used unless a significant number of CFS records are available for each reporting area.*

*Note that the number of service minutes for each reporting area used in the example for BEAT/PLAN is determined by multiplying the number of CFS incidents by the average service time per CFS. This method was only used in order to illustrate the use of service time as a measure of relative reporting area workload.

APPENDIX C

SOLUTIONS TO DATA PREPARATION EXERCISES

Exercise 1: Use the DATA/PLAN program to create a data file containing the data items listed in Table 3-1 for records 1 through 20 in Appendix A. Verify that the data has been correctly entered, and save the file on disk.

The solution to Exercise 1 is illustrated in Displays 1 through 75 in Section C of Chapter III in the DATA/PLAN user's manual.* The contents of each display are explained in Section B of that chapter.

Exercise 2: Use the DATA/PLAN program to create a data file containing records 21 through 94 listed in Appendix A. Verify that the data has been correctly entered, and save the file on disk. Based on the data in this file, tabulate the average travel time (i.e., the time interval between the time dispatched and the time arrived) for all calls (CFS and non-CFS).

The procedure for creating a data file containing records 21 through 94 is identical to that used in Exercise 1 and illustrated in Displays 1 through 75 of the DATA/PLAN user's manual. The tabulation of the average travel time for these records is illustrated in Displays 1 through 11 at the end of this appendix. The steps illustrated include the following:

- The DATA/PLAN analysis is initiated by entering the command RUN DATA/PLAN. The title page is displayed (Display 1), a print option is selected (Display 2), and the table of contents is displayed (Display 3). Page 2 is selected.
- The data in records 21 through 94 are entered from the data file previously saved on disk with the name FILE #2 (Displays 4 and 5).

---

*See POLICE/PLAN--An Easy-to-Use Resource Allocation System: User's Manual for PATROL/PLAN, BEAT/PLAN, and DATA/PLAN Software on Apple II Microcomputer.

Preceding page blank

- Page 4 is selected. The option for tabulating data previously entered into the Apple's memory is specified (Display 6). Tabulation option 4 is used to review the record selection criteria in effect to verify that all records will be processed (Displays 7 and 8).

- The average travel time is computed using tabulation option 1 (Displays 9, 10, and 11).

> Exercise 3: Based on records 1 through 94 (i.e., the data in the two files created in exercises 1 and 2), use DATA/PLAN to tabulate the average service time (i.e., the time interval between the time dispatched and the time cleared) by priority for calls on the Day shift.

The solution to Exercise 3 is illustrated in Displays 12 through 23 at the end of this appendix. The steps illustrated include the following:

- Tabulation option 5 is used to specify the names of the two data files containing the 94 records to be tabulated (Displays 12 and 13).

- Tabulation option 6 is used to specify record selection criteria to tabulate only those records for calls on the Day shift (Displays 14 through 17).

- Tabulation option 3 is used to compute average service time by priority level for calls on the Day shift (Displays 18 through 23).


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*              D A T A / P L A N             *
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*              OCTOBER 1979                  *
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*          THE INSTITUTE FOR PUBLIC          *
*              PROGRAM ANALYSIS              *
*            ST. LOUIS, MISSOURI             *
*                                            *
*          DEVELOPED FOR THE NATIONAL        *
*      INSTITUTE OF LAW ENFORCEMENT AND      *
*        CRIMINAL JUSTICE, L.E.A.A.          *
*        U.S. DEPARTMENT OF JUSTICE.         *
*         ( GRANT NO: 78NI-AX-0015 )         *
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1

Do You Want Printed Output? Y

```
THE INSTITUTE FOR PUBLIC  PAGE 5
    PROGRAM ANALYSIS

        DATA/PLAN

PRINT OPTIONS:

   1  DISPLAY ONLY
   2  PRINT SPECIFIED PAGES ONLY
   3  PRINT ALL OUTPUT

OPTION T3
```

2

THE INSTITUTE FOR PUBLIC PAGE 1
PROGRAM ANALYSIS

DATA/PLAN

TABLE OF CONTENTS

PAGE

0 TERMINATE PROCESSING
1 DISPLAY TABLE OF CONTENTS
2 ENTER DATA TO BE TABULATED
3 VERIFY/MODIFY/SAVE DATA
4 TABULATE DATA
5 MODIFY PRINT OPTION
6 INSERT COMMENTS INTO OUTPUT

Go To Page? 2

THE INSTITUTE FOR PUBLIC PAGE 2
PROGRAM ANALYSIS

DATA/PLAN

INPUT OPTIONS:

0 GO TO NEW PAGE
1 KEY IN NEW DATA
2 ENTER DATA FROM DISK
3 ADD DATA TO AN EXISTING DATA FILE

OPTION ?2

THE INSTITUTE FOR PUBLIC PAGE 2
PROGRAM ANALYSIS

DATA/PLAN

NAME OF DATA FILE ?FILE #2

FILE CONTAINS: DISPATCH DATA - FILE #2

NO OF RECORDS: 74

DATA ITEMS:

0: RECORD ID
1: PRIORITY
2: NO OF UNITS
3: AREA ID
4: DISP. TIME
5: ARVD. TIME
6: CLEAR TIME
7: SRVC TIME-2
8: SRVC TIME-3

DATA HAS BEEN ENTERED

Go To Page? 4

THE INSTITUTE FOR PUBLIC PAGE 4
PROGRAM ANALYSIS

DATA/PLAN

OPTIONS:

1 DATA TO BE ANALYZED HAS BEEN ENTERED INTO MEMORY

2 DATA TO BE ANALYZED IS STORED ON DISK

OPTION ?1

PROGRAM ANALYSIS

DATA/PLAN

TABULATION OPTIONS:

0 GO TO NEW PAGE
1 DISPLAY TOTAL, AVERAGE, MINIMUM, AND MAXIMUM VALUES OF A DATA ITEM
2 DISPLAY FREQUENCIES OF DATA ITEM VALUES
3 DISPLAY TOTAL AND AVERAGE VALUES OF ONE DATA ITEM VERSUS VALUES OF A SECOND DATA ITEM
4 REVIEW RECORD SELECTION CRITERIA
5 PROCESS OTHER DATA FILES
6 SPECIFY NEW RECORD SELECTION CRITERIA
7 MODIFY RECORD SELECTION CRITERIA
8 PERFORM A REPETITIVE TABULATION

OPTION T4

7

THE INSTITUTE FOR PUBLIC PAGE 4
PROGRAM ANALYSIS

DATA/PLAN

SUMMARY OF RECORD SELECTION CRITERIA

8

PROCESS ALL RECORDS

PROGRAM ANALYSIS

DATA/PLAN

TABULATION OPTIONS:

0 GO TO NEW PAGE
1 DISPLAY TOTAL, AVERAGE, MINIMUM, AND MAXIMUM VALUES OF A DATA ITEM
2 DISPLAY FREQUENCIES OF DATA ITEM VALUES
3 DISPLAY TOTAL AND AVERAGE VALUES OF ONE DATA ITEM VERSUS VALUES OF A SECOND DATA ITEM
4 REVIEW RECORD SELECTION CRITERIA
5 PROCESS OTHER DATA FILES
6 SPECIFY NEW RECORD SELECTION CRITERIA
7 MODIFY RECORD SELECTION CRITERIA
8 PERFORM A REPETITIVE TABULATION

OPTION T1

9

THE INSTITUTE FOR PUBLIC PAGE 4
PROGRAM ANALYSIS

DATA/PLAN

DATA ITEMS:

0: RECORD ID	1: PRIORITY
2: NO OF UNITS	3: AREA ID
4: DISP. TIME	5: ARVD. TIME
6: CLEAR TIME	7: SRVC TIME-2
8: SRVC TIME-3	9: TIME INTERVAL

DATA ITEM TO BE TABULATED T9

NAME OF TIME INTERVAL TTRAVEL TIME

NO OF ITEM CONTAINING
TIME AT START OF INTERVAL T4

NO OF ITEM CONTAINING
TIME AT END OF INTERVAL T5

10

DATA/PLAN

TABULATION OF TRAVEL TIME

TOTAL RECORDS PROCESSED	74
RECORDS MEETING CRITERIA	74
MISSING VALUES	25
NON-MISSING VALUES	49

TOTAL	270
AVERAGE	5.51
MEDIAN	4
MINIMUM	0
MAXIMUM	23

DATA/PLAN

TABULATION OPTIONS:

0 GO TO NEW PAGE
1 DISPLAY TOTAL, AVERAGE, MINIMUM, AND MAXIMUM VALUES OF A DATA ITEM
2 DISPLAY FREQUENCIES OF DATA ITEM VALUES
3 DISPLAY TOTAL AND AVERAGE VALUES OF ONE DATA ITEM VERSUS VALUES OF A SECOND DATA ITEM
4 REVIEW RECORD SELECTION CRITERIA
5 PROCESS OTHER DATA FILES
6 SPECIFY NEW RECORD SELECTION CRITERIA
7 MODIFY RECORD SELECTION CRITERIA
8 PERFORM A REPETITIVE TABULATION

OPTION T5

DATA/PLAN

OPTIONS:

1 DATA TO BE ANALYZED HAS BEEN ENTERED INTO MEMORY

2 DATA TO BE ANALYZED IS STORED ON DISK

OPTION T2

NO OF FILES TO BE PROCESSED T2

ENTER FILE NAMES:

TFILE #1
TFILE #2

DATA/PLAN

TABULATION OPTIONS:

0 GO TO NEW PAGE
1 DISPLAY TOTAL, AVERAGE, MINIMUM, AND MAXIMUM VALUES OF A DATA ITEM
2 DISPLAY FREQUENCIES OF DATA ITEM VALUES
3 DISPLAY TOTAL AND AVERAGE VALUES OF ONE DATA ITEM VERSUS VALUES OF A SECOND DATA ITEM
4 REVIEW RECORD SELECTION CRITERIA
5 PROCESS OTHER DATA FILES
6 SPECIFY NEW RECORD SELECTION CRITERIA
7 MODIFY RECORD SELECTION CRITERIA
8 PERFORM A REPETITIVE TABULATION

OPTION T6

RECORD SELECTION OPTIONS:

1 PROCESS ALL RECORDS

2 RECORDS WITH RANGE OF VALUES FOR A DATA ITEM

3 RECORDS WITH ONE OF SPECIFIED ALTERNATIVE VALUES FOR A DATA ITEM

4 RECORDS WITH SPECIFIED VALUE FOR A DATA ITEM

OPTION ?2

15

DATA ITEMS:

0: RECORD ID	1: PRIORITY
2: NO OF UNITS	3: AREA ID
4: DISP. TIME	5: ARVD. TIME
6: CLEAR TIME	7: SRVC TIME-2
8: SRVC TIME-3	9: TIME INTERVAL

DATA ITEM ?4

MINIMUM VALUE OF INTEREST ?800

MAXIMUM VALUE OF INTEREST ?1559

ARE THERE OTHER SELECTION CRITERIA ?N

16

SUMMARY OF RECORD SELECTION CRITERIA

17

DISP. TIME => 800 AND
<= 1559

TABULATION OPTIONS:

0 GO TO NEW PAGE
1 DISPLAY TOTAL, AVERAGE, MINIMUM, AND MAXIMUM VALUES OF A DATA ITEM
2 DISPLAY FREQUENCIES OF DATA ITEM VALUES
3 DISPLAY TOTAL AND AVERAGE VALUES OF ONE DATA ITEM VERSUS VALUES OF A SECOND DATA ITEM
4 REVIEW RECORD SELECTION CRITERIA
5 PROCESS OTHER DATA FILES
6 SPECIFY NEW RECORD SELECTION CRITERIA
7 MODIFY RECORD SELECTION CRITERIA
8 PERFORM A REPETITIVE TABULATION

OPTION ?3

18

DATA/PLAN

DATA ITEMS:

0: RECORD ID	1: PRIORITY
2: NO OF UNITS	3: AREA ID
4: DISP. TIME	5: ARVD. TIME
6: CLEAR TIME	7: SRVC TIME-2
8: SRVC TIME-3	9: TIME INTERVAL

DATA ITEM TO BE TABULATED ?9

NAME OF TIME INTERVAL ?SERVICE TIME

NO OF ITEM CONTAINING
TIME AT START OF INTERVAL ?4

NO OF ITEM CONTAINING
TIME AT END OF INTERVAL ?6

DATA/PLAN

DATA ITEMS:

0: RECORD ID	1: PRIORITY
2: NO OF UNITS	3: AREA ID
4: DISP. TIME	5: ARVD. TIME
6: CLEAR TIME	7: SRVC TIME-2
8: SRVC TIME-3	9: SERVICE TIME

SECOND DATA ITEM ?1

FOR PRIORITY, ENTER:

MINIMUM VALUE OF INTEREST	?0
INTERVAL SIZE	?1
NO OF INTERVALS	?4

FILE #1 IS BEING PROCESSED
FILE #2 IS BEING PROCESSED

DATA/PLAN

TABULATION OF SERVICE TIME

TOTAL RECORDS PROCESSED	94
RECORDS MEETING CRITERIA	17
MISSING VALUES	4
NON-MISSING VALUES	13

DATA/PLAN

SERVICE TIME

VALUE OF PRIORITY	NO OF RECORDS	TOTAL	AVERAGE
< 0	0	0	—
=> 0 < 1	4	57	14.3
=> 1 < 2	1	79	79
=> 2 < 3	7	203	29

THE INSTITUTE FOR PUBLIC PROGRAM ANALYSIS PAGE 4

DATA/PLAN

SERVICE TIME

VALUE OF PRIORITY	NO OF RECORDS	TOTAL	AVERAGE
=> 3 < 4	1	22	22
=> 4	0	0	-
MISSING	0	0	-

PROGRAM ANALYSIS

DATA/PLAN

TABULATION OPTIONS:

0 GO TO NEW PAGE
1 DISPLAY TOTAL, AVERAGE, MINIMUM, AND MAXIMUM VALUES OF A DATA ITEM
2 DISPLAY FREQUENCIES OF DATA ITEM VALUES
3 DISPLAY TOTAL AND AVERAGE VALUES OF ONE DATA ITEM VERSUS VALUES OF A SECOND DATA ITEM
4 REVIEW RECORD SELECTION CRITERIA
5 PROCESS OTHER DATA FILES
6 SPECIFY NEW RECORD SELECTION CRITERIA
7 MODIFY RECORD SELECTION CRITERIA
8 PERFORM A REPETITIVE TABULATION

OPTION TO

Go To Page? 0

APPENDIX D

SOLUTIONS TO PATROL CAR DEPLOYMENT EXERCISES

Exercise 4: Use PATROL/PLAN and the input data in Table 4-1 to estimate the following performance characteristics for each shift in Law City.

- average number of units dispatched per CFS;
- average service time per CFS per unit;
- average service time per CFS;
- incoming work per unit;
- actual work per unit;
- uncommitted time per unit;
- average number of free units;
- probability of saturation or percent of time backup units are used;
- average patrol interval;
- average queue delay for priority 1, 2, and 3 calls;
- average travel time; and
- average response time for priority 1, 2, and 3 calls.

The solution to Exercise 4 is illustrated in Displays 1 through 32 at the end of this appendix. The steps illustrated include the following:

- The PATROL/PLAN analysis is initiated by entering the command RUN PATROL/PLAN. The title page is displayed and the printing of selected pages is requested (Display 1). The table of contents is displayed (Display 2). Page 2 is selected.
- Three blocks are specified, corresponding to the Night, Day, and Afternoon shifts in Law City (Display 3).
- All input data items are specified for Block 1 (i.e., the Night shift) using the data in Table 4-1 (Displays 4 through 9*), a summary of the input data is displayed

*Note that the complete input process is not illustrated in the displays.

Preceding page blank

(Displays 10 and 11), and the performance characteristics for the Night shift are displayed (Displays 12, 13, and 14).

- Input data items are specified (Displays 15 through 18), an input summary is displayed (Displays 19 and 20), and performance characteristics are displayed (Displays 21, 22, and 23) for the Day shift.

- Input data items are specified (Displays 24 through 27), an input summary is displayed (Displays 28 and 29), and performance characteristics are displayed (Displays 30, 31, and 32) for the Afternoon shift.

Exercise 5: Suppose that a study has been released, claiming that adequate police protection cannot be provided unless a department can meet the following hypothetical standards for patrol operations:

- Each unit has a minimum of 20 minutes per hour of uncommitted time.
- The probability that a call for service must be queued or assigned to a non-patrol unit is less than five percent.
- The patrol force can pass every location in its region at least once during each eight-hour shift.
- The average response time is less than five minutes.

a) Use PATROL/PLAN to determine how many additional patrol units would be needed on each shift to meet all of the standards specified above.

b) Identify which standard was the most difficult to satisfy on each shift.

c) Determine how many additional units would be needed on the Day shift if no backup units are used.

The solution to Exercise 5 is illustrated in Displays 33 through 46 at the end of this appendix. The steps illustrated include the following:

- Constraints are specified for uncommitted time, the percent of calls occurring when all units are busy,

minimum patrol interval, and average response time (Displays 33 through 36).

- The number of patrol units required to meet these four constraints on the Night shift is determined (Display 37). Five units are required to meet the specified constraints on both minimum patrol interval and average response time.

- The number of units required to meet these same constraints on the Day shift is determined (Display 38). Nine units are required to provide a patrol interval of eight hours or less.

- The number of units required on the afternoon shift is determined (Display 39). Nine units are required to satisfy the imposed constraint on patrol interval.

- The dispatch option is modified for the Day shift (Displays 40 and 41), the four constraints are respecified (Displays 42 through 45), and the number of units required to meet the constraints on the Day shift when no backup units are used is determined (Display 46). Nine units are required.

Exercise 6: The crime analysis team for the Law City Police Department has projected an 11.8 percent increase in the CFS rate for each shift due primarily to increased population in new subdivisions. A PATROL/PLAN analysis has shown that one additional patrol unit will be needed on each shift to maintain existing performance levels (i.e., the same uncommitted time, patrol interval, saturation probability, and average response time found in Exercise 4). This analysis also indicated that assigning an equal number of units to each shift results in an unequal distribution of work. In anticipation of a directive from the Chief's office to recommend new allocations by shift, perform the following analysis using PATROL/PLAN:

a) Allocate the 15 units over the three shifts based on the data shown in Table 4-1 and the increased call rates, using patrol interval time as the allocation variable. Allocate the units to minimize the patrol interval on each shift. Assume that no shift can lose units in the reallocation (i.e., units can only be added to the current levels).

b) Repeat the analysis described above, but assume that units can be added to or subtracted from current shift levels.

c) Repeat the analysis described in (b), but minimize overall average patrol interval.

The solution to Exercise 6 is illustrated in Displays 47 through 60 at the end of this appendix. The steps illustrated include the following:

- The call rates for the three shifts are modified to reflect the projected increase (Displays 47 through 53). The dispatch option for the Day shift is modified to use backup units for priority 1 calls.
- The 15 available units are allocated among the three shifts in a way that minimizes the maximum patrol interval occurring on any shift (Displays 54, 55, and 56). Note that a minimum of four units is specified for each shift to ensure that no shift loses units in the reallocation.
- The 15 units are reallocated among the shifts (Displays 57, 58 and 59), with units allowed to be subtracted from the current shift levels (i.e., a minimum of zero units is specified for each shift).

- The 15 units are reallocated among the shifts in a way that minimizes the overall average patrol interval (Display 60).

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*     INSTITUTE OF LAW ENFORCEMENT AND       *
*       CRIMINAL JUSTICE, L.E.A.A.,          *
*       U.S. DEPARTMENT OF JUSTICE.          *
*         (GRANT NO: 78NI-AX-0015)           *
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PRINT SELECTED PAGES (Y/N) ? Y
PRINT PAGE (Y/N) ? Y
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1

PATROL/PLAN

TABLE OF CONTENTS

PAGE

0 STOP PROGRAM
1 DISPLAY TABLE OF CONTENTS
2 INPUT/MODIFY BLOCK NAMES
3 INPUT/MODIFY BLOCK DATA
4 DISPLAY INPUT DATA SUMMARY
5 DISPLAY OUTPUT DATA SUMMARY
6 SATISFY MULTIPLE CONSTRAINTS FOR ONE BLOCK
7 ALLOCATE UNITS AMONG SEVERAL BLOCKS

GO TO PAGE ? 2 PRINT PAGE (Y/N) ? Y

2

PATROL/PLAN

INPUT NO OF BLOCKS (1-7) ? 3

INPUT BLOCK NAMES (1-10 CHARACTERS):

BLOCK 1 ? NIGHT

BLOCK 2 ? DAY

BLOCK 3 ? AFTERNOON

GO TO PAGE ? 3 BLOCK ? NIGHT
PRINT PAGE (Y/N) ? Y

3

PATROL/PLAN

INPUT DATA - BLOCK 1: NIGHT

1 BLOCK NAME	9 REGION AREA
2 NO OF UNITS	10 RESPONSE SPEEDS
3 CALL RATE	11 PATROLLED STREETS
4 NO OF UNITS/CFS	12 PATROL SPEED
5 SERVICE TIMES	13 COPY ANOTHER BLOCK
6 NON-CFS TIME/ UNIT	14 INPUT ALL DATA ITEMS
7 DISPATCH POLICY	15 CHANGE PRINT OPTION
8 % CFS/PRIORITY	

INPUT DATA ITEM NO ? 14

PRINT PAGE (Y/N) ? Y

PATROL/PLAN

INPUT DATA - BLOCK 1: NIGHT

1	BLOCK NAME	9	REGION AREA
2	NO OF UNITS	10	RESPONSE SPEEDS
3	CALL RATE	11	PATROLLED STREETS
4	NO OF UNITS/CFS	12	PATROL SPEED
5	SERVICE TIMES	13	COPY ANOTHER BLOCK
6	NON-CFS TIME/ UNIT	14	INPUT ALL DATA ITEMS
7	DISPATCH POLICY	15	CHANGE PRINT OPTION
8	% CFS/PRIORITY		

DATA ITEM NO: 1
BLOCK NAME: NIGHT
NEW NAME: ?

PRINT PAGE (Y/N) ? Y

PATROL/PLAN

INPUT DATA - BLOCK 1: NIGHT

1	BLOCK NAME	9	REGION AREA
2	NO OF UNITS	10	RESPONSE SPEEDS
3	CALL RATE	11	PATROLLED STREETS
4	NO OF UNITS/CFS	12	PATROL SPEED
5	SERVICE TIMES	13	COPY ANOTHER BLOCK
6	NON-CFS TIME/ UNIT	14	INPUT ALL DATA ITEMS
7	DISPATCH POLICY	15	CHANGE PRINT OPTION
8	% CFS/PRIORITY		

DATA ITEM NO: 2
NO OF UNITS = 1
NEW VALUE ? 4

PRINT PAGE (Y/N) ? Y

PATROL/PLAN

INPUT DATA - BLOCK 1: NIGHT

1	BLOCK NAME	9	REGION AREA
2	NO OF UNITS	10	RESPONSE SPEEDS
3	CALL RATE	11	PATROLLED STREETS
4	NO OF UNITS/CFS	12	PATROL SPEED
5	SERVICE TIMES	13	COPY ANOTHER BLOCK
6	NON-CFS TIME/ UNIT	14	INPUT ALL DATA ITEMS
7	DISPATCH POLICY	15	CHANGE PRINT OPTION
8	% CFS/PRIORITY		

DATA ITEM NO: 3
CALL RATE = 1 CFS/HR
NEW VALUE ? 1.14

PRINT PAGE (Y/N) ? Y

PATROL/PLAN

INPUT DATA - BLOCK 1: NIGHT

1 BLOCK NAME	9 REGION AREA
2 NO OF UNITS	10 RESPONSE SPEEDS
3 CALL RATE	11 PATROLLED STREETS
4 NO OF UNITS/CFS	12 PATROL SPEED
5 SERVICE TIMES	13 COPY ANOTHER BLOCK
6 NON-CFS TIME/ UNIT	14 INPUT ALL DATA ITEMS
7 DISPATCH POLICY	15 CHANGE PRINT OPTION
8 % CFS/PRIORITY	

DATA ITEM NO: 12
PATROL SPEED = 1 MPH
NEW VALUE ? 10.7

PRINT PAGE (Y/N) ? Y

THE INSTITUTE FOR PUBLIC PAGE 3
PROGRAM ANALYSIS

PATROL/PLAN

INPUT DATA - BLOCK 1: NIGHT

1 BLOCK NAME	9 REGION AREA
2 NO OF UNITS	10 RESPONSE SPEEDS
3 CALL RATE	11 PATROLLED STREETS
4 NO OF UNITS/CFS	12 PATROL SPEED
5 SERVICE TIMES	13 COPY ANOTHER BLOCK
6 NON-CFS TIME/ UNIT	14 INPUT ALL DATA ITEMS
7 DISPATCH POLICY	15 CHANGE PRINT OPTION
8 % CFS/PRIORITY	

INPUT DATA ITEM NO ? 0

GO TO PAGE ? 4 BLOCK ?
PRINT PAGE (Y/N) ? Y

PATROL/PLAN

INPUT SUMMARY - BLOCK 1: NIGHT

NO OF UNITS	=	4
CALL RATE	=	1.1 CFS/HR
NON-CFS TIME/UNIT	=	2.0 MIN/HR

NO OF UNITS DISP/CFS	PERCENT OF CALLS	SERVICE TIME (MIN)
1	51.0	24.7
2	41.2	15.8
3	7.8	6.8

TO CONTINUE, HIT RETURN
PRINT PAGE (Y/N) ? Y

THE INSTITUTE FOR PUBLIC PAGE 4
PROGRAM ANALYSIS

PATROL/PLAN

INPUT SUMMARY - BLOCK 1: NIGHT

REGION AREA	=	15.3 SQ MILES
PATROLLED STREETS	=	323.4 MILES
PATROL SPEED	=	10.7 MPH
DISPATCH POLICY	=	3 (NO BACKUP UNITS)

PRIORITY LEVEL	PERCENT OF CALLS	RESPONSE SPEED (MPH)
1	23.5	18.6
2	62.8	18.6
3	13.7	18.6

GO TO PAGE ? 5 BLOCK ?
PRINT PAGE (Y/N) ? Y

PATROL/PLAN

OUTPUT SUMMARY - BLOCK 1: NIGHT

NO OF UNITS DISP/CFS = 1.57
SERVICE TIME/DISP UNIT = 21.0 MIN
SERVICE TIME/CFS = 33.0 UNIT-MIN

WORKLOAD DISTRIBUTION (MIN/HR)

PRIORITY LEVEL	PRIMARY UNITS (ACTUAL)	BACKUP UNITS (ACTUAL)	TOTAL (INCOMING)
1	10.7	0.0	10.7
2	28.6	0.0	28.6
3	6.3	0.0	6.3
TOTAL	45.7	0.0	45.7

TO CONTINUE, HIT RETURN
PRINT PAGE (Y/N) ? Y

PATROL/PLAN

OUTPUT SUMMARY - BLOCK 1: NIGHT

INCOMING CFS & NON-CFS
WORK/UNIT = 11.4 MIN/HR

ACTUAL CFS & NON-CFS
WORK/UNIT = 11.4 MIN/HR
ACTUAL CFS WORK/UNIT = 9.4 MIN/HR
NON-CFS WORK/UNIT = 2.0 MIN/HR
UNCOMMITTED TIME/UNIT = 48.6 MIN/HR

AVG NO OF FREE UNITS = 3.2
MINIMUM PATROL INTERVAL = 9.3 HRS

TO CONTINUE, HIT RETURN
PRINT PAGE (Y/N) ? Y

PATROL/PLAN

OUTPUT SUMMARY - BLOCK 1: NIGHT

% OF PRIORITY 1 CALLS DELAYED IN QUEUE = 0.8
% OF PRIORITY 2 CALLS DELAYED IN QUEUE = 0.8
% OF PRIORITY 3 CALLS DELAYED IN QUEUE = 0.8
AVG NO OF CALLS IN QUEUE = 0.0

PRIORITY LEVEL	QUEUE DELAY	TRAVEL TIME	RESPONSE TIME
1	0.1	5.0	5.1
2	0.1	5.0	5.1
3	0.1	5.0	5.1
AVG	0.1	5.0	5.1

GO TO PAGE ? 3 BLOCK ? DAY
PRINT PAGE (Y/N) ? Y

PATROL/PLAN

INPUT DATA - BLOCK 2: DAY

1	BLOCK NAME	9	REGION AREA
2	NO OF UNITS	10	RESPONSE SPEEDS
3	CALL RATE	11	PATROLLED STREETS
4	NO OF UNITS/CFS	12	PATROL SPEED
5	SERVICE TIMES	13	COPY ANOTHER BLOCK
6	NON-CFS TIME/UNIT	14	INPUT ALL DATA ITEMS
7	DISPATCH POLICY	15	CHANGE PRINT OPTION
8	% CFS/PRIORITY		

INPUT DATA ITEM NO ? 14

PRINT PAGE (Y/N) ? Y

```
        THE INSTITUTE FOR PUBLIC  PAGE 3
            PROGRAM ANALYSIS

                  PATROL/PLAN

INPUT DATA - BLOCK 2: DAY

1 BLOCK NAME          9 REGION AREA
2 NO OF UNITS        10 RESPONSE SPEEDS
3 CALL RATE          11 PATROLLED STREETS
4 NO OF UNITS/CFS    12 PATROL SPEED
5 SERVICE TIMES      13 COPY ANOTHER BLOCK
6 NON-CFS TIME/      14 INPUT ALL DATA
  UNIT                  ITEMS
7 DISPATCH POLICY    15 CHANGE PRINT
8 % CFS/PRIORITY        OPTION


DATA ITEM NO: 1
BLOCK NAME: DAY
NEW NAME: ?

PRINT PAGE (Y/N) ? Y
```

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```
        THE INSTITUTE FOR PUBLIC  PAGE 3
            PROGRAM ANALYSIS

                  PATROL/PLAN

INPUT DATA - BLOCK 2: DAY

1 BLOCK NAME          9 REGION AREA
2 NO OF UNITS        10 RESPONSE SPEEDS
3 CALL RATE          11 PATROLLED STREETS
4 NO OF UNITS/CFS    12 PATROL SPEED
5 SERVICE TIMES      13 COPY ANOTHER BLOCK
6 NON-CFS TIME/      14 INPUT ALL DATA
  UNIT                  ITEMS
7 DISPATCH POLICY    15 CHANGE PRINT
8 % CFS/PRIORITY        OPTION


DATA ITEM NO: 12
PATROL SPEED = 1 MPH
NEW VALUE ? 6.1

PRINT PAGE (Y/N) ? Y
```

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```
        THE INSTITUTE FOR PUBLIC  PAGE 3
            PROGRAM ANALYSIS

                  PATROL/PLAN

INPUT DATA - BLOCK 2: DAY

1 BLOCK NAME          9 REGION AREA
2 NO OF UNITS        10 RESPONSE SPEEDS
3 CALL RATE          11 PATROLLED STREETS
4 NO OF UNITS/CFS    12 PATROL SPEED
5 SERVICE TIMES      13 COPY ANOTHER BLOCK
6 NON-CFS TIME/      14 INPUT ALL DATA
  UNIT                  ITEMS
7 DISPATCH POLICY    15 CHANGE PRINT
8 % CFS/PRIORITY        OPTION


INPUT DATA ITEM NO ? 0


GO TO PAGE ? 4          BLOCK ?
PRINT PAGE (Y/N) ? Y
```

18

CONTINUED

1 OF 2

PATROL/PLAN

INPUT SUMMARY - BLOCK 2: DAY

NO OF UNITS = 4
CALL RATE = 1.5 CFS/HR
NON-CFS TIME/UNIT = 3.2 MIN/HR

NO OF UNITS DISP/CFS	PERCENT OF CALLS	SERVICE TIME (MIN)
1	38.2	41.9
2	51.5	17.0
3	10.3	6.7

TO CONTINUE, HIT RETURN
PRINT PAGE (Y/N) ? Y

PATROL/PLAN

INPUT SUMMARY - BLOCK 2: DAY

REGION AREA = 15.3 SQ MILES
PATROLLED STREETS = 323.4 MILES
PATROL SPEED = 6.1 MPH
DISPATCH POLICY = 2 (BACKUP UNITS FOR PRIORITY 1 CALLS ONLY)

PRIORITY LEVEL	PERCENT OF CALLS	RESPONSE SPEED (MPH)
1	16.2	13.7
2	72.1	13.7
3	11.8	13.7

GO TO PAGE ? 5 BLOCK ?
PRINT PAGE (Y/N) ? Y

PATROL/PLAN

OUTPUT SUMMARY - BLOCK 2: DAY

NO OF UNITS DISP/CFS = 1.72
SERVICE TIME/DISP UNIT = 30.9 MIN
SERVICE TIME/CFS = 53.1 UNIT-MIN

WORKLOAD DISTRIBUTION (MIN/HR)

PRIORITY LEVEL	PRIMARY UNITS (ACTUAL)	BACKUP UNITS (ACTUAL)	TOTAL (INCOMING)
1	14.0	1.1	15.1
2	67.3	0.0	67.3
3	11.0	0.0	11.0
TOTAL	92.2	1.1	93.3

TO CONTINUE, HIT RETURN
PRINT PAGE (Y/N) ? Y

PATROL/PLAN

OUTPUT SUMMARY - BLOCK 2: DAY

INCOMING CFS & NON-CFS WORK/UNIT = 23.3 MIN/HR

ACTUAL CFS & NON-CFS WORK/UNIT = 23.0 MIN/HR
  ACTUAL CFS WORK/UNIT = 19.8 MIN/HR
  NON-CFS WORK/UNIT = 3.2 MIN/HR
UNCOMMITTED TIME/UNIT = 37.0 MIN/HR

AVG NO OF FREE UNITS = 2.5
MINIMUM PATROL INTERVAL = 21.5 HRS

TO CONTINUE, HIT RETURN
PRINT PAGE (Y/N) ? Y

PATROL/PLAN

OUTPUT SUMMARY - BLOCK 2: DAY

% OF PRIORITY 1 CALLS ASSIGNED TO BACKUP UNITS	=	7.6
% OF PRIORITY 2 CALLS DELAYED IN QUEUE	=	7.6
% OF PRIORITY 3 CALLS DELAYED IN QUEUE	=	7.6
AVG NO OF CALLS IN QUEUE	=	0.0

PRIORITY LEVEL	QUEUE DELAY	TRAVEL TIME	RESPONSE TIME
1	0.0	7.8	7.8
2	1.4	7.8	9.2
3	2.1	7.8	9.8
AVG	1.3	7.8	9.0

GO TO PAGE ? 3 BLOCK ? AFTERNOON
PRINT PAGE (Y/N) ? Y

PATROL/PLAN

INPUT DATA - BLOCK 3: AFTERNOON

1	BLOCK NAME	9	REGION AREA
2	NO OF UNITS	10	RESPONSE SPEEDS
3	CALL RATE	11	PATROLLED STREETS
4	NO OF UNITS/CFS	12	PATROL SPEED
5	SERVICE TIMES	13	COPY ANOTHER BLOCK
6	NON-CFS TIME/ UNIT	14	INPUT ALL DATA ITEMS
7	DISPATCH POLICY	15	CHANGE PRINT OPTION
8	% CFS/PRIORITY		

INPUT DATA ITEM NO ? 14

PRINT PAGE (Y/N) ? Y

PATROL/PLAN

INPUT DATA - BLOCK 3: AFTERNOON

1	BLOCK NAME	9	REGION AREA
2	NO OF UNITS	10	RESPONSE SPEEDS
3	CALL RATE	11	PATROLLED STREETS
4	NO OF UNITS/CFS	12	PATROL SPEED
5	SERVICE TIMES	13	COPY ANOTHER BLOCK
6	NON-CFS TIME/ UNIT	14	INPUT ALL DATA ITEMS
7	DISPATCH POLICY	15	CHANGE PRINT OPTION
8	% CFS/PRIORITY		

DATA ITEM NO: 1
BLOCK NAME: AFTERNOON
NEW NAME: ?

PRINT PAGE (Y/N) ? Y

PATROL/PLAN

INPUT DATA - BLOCK 3: AFTERNOON

1	BLOCK NAME	9	REGION AREA
2	NO OF UNITS	10	RESPONSE SPEEDS
3	CALL RATE	11	PATROLLED STREETS
4	NO OF UNITS/CFS	12	PATROL SPEED
5	SERVICE TIMES	13	COPY ANOTHER BLOCK
6	NON-CFS TIME/ UNIT	14	INPUT ALL DATA ITEMS
7	DISPATCH POLICY	15	CHANGE PRINT OPTION
8	% CFS/PRIORITY		

DATA ITEM NO: 12
PATROL SPEED = 1 MPH
NEW VALUE ? 6.2

PRINT PAGE (Y/N) ? Y

PATROL/PLAN

INPUT DATA - BLOCK 3: AFTERNOON

1	BLOCK NAME	9	REGION AREA
2	NO OF UNITS	10	RESPONSE SPEEDS
3	CALL RATE	11	PATROLLED STREETS
4	NO OF UNITS/CFS	12	PATROL SPEED
5	SERVICE TIMES	13	COPY ANOTHER BLOCK
6	NON-CFS TIME/ UNIT	14	INPUT ALL DATA ITEMS
7	DISPATCH POLICY	15	CHANGE PRINT OPTION
8	% CFS/PRIORITY		

INPUT DATA ITEM NO ? 0

GO TO PAGE ? 4 BLOCK ?
PRINT PAGE (Y/N) ? Y

PATROL/PLAN

INPUT SUMMARY - BLOCK 3: AFTERNOON

NO OF UNITS	=	4
CALL RATE	=	2.8 CFS/HR
NON-CFS TIME/UNIT	=	6.9 MIN/HR

NO OF UNITS DISP/CFS	PERCENT OF CALLS	SERVICE TIME (MIN)
1	44.4	39.8
2	40.3	16.5
3	15.3	8.4

TO CONTINUE, HIT RETURN
PRINT PAGE (Y/N) ? Y

PATROL/PLAN

INPUT SUMMARY - BLOCK 3: AFTERNOON

REGION AREA	=	15.3 SQ MILES
PATROLLED STREETS	=	323.4 MILES
PATROL SPEED	=	6.2 MPH
DISPATCH POLICY	=	3 (NO BACKUP UNITS)

PRIORITY LEVEL	PERCENT OF CALLS	RESPONSE SPEED (MPH)
1	24.2	22.7
2	70.2	22.7
3	5.7	22.7

GO TO PAGE ? 5 BLOCK ?
PRINT PAGE (Y/N) ? Y

PATROL/PLAN

OUTPUT SUMMARY - BLOCK 3: AFTERNOON

NO OF UNITS DISP/CFS = 1.71
SERVICE TIME/DISP UNIT = 29.4 MIN
SERVICE TIME/CFS = 50.2 UNIT-MIN

WORKLOAD DISTRIBUTION (MIN/HR)

PRIORITY LEVEL	PRIMARY UNITS (ACTUAL)	BACKUP UNITS (ACTUAL)	TOTAL (INCOMING)
1	40.3	0.0	40.3
2	116.9	0.0	116.9
3	9.4	0.0	9.4
TOTAL	166.6	0.0	166.6

TO CONTINUE, HIT RETURN
PRINT PAGE (Y/N) ? Y

PATROL/PLAN

OUTPUT SUMMARY - BLOCK 3: AFTERNOON

INCOMING CFS & NON-CFS WORK/UNIT = 41.7 MIN/HR

ACTUAL CFS & NON-CFS WORK/UNIT = 41.7 MIN/HR
  ACTUAL CFS WORK/UNIT = 34.8 MIN/HR
  NON-CFS WORK/UNIT = 6.9 MIN/HR
UNCOMMITTED TIME/UNIT = 18.3 MIN/HR

AVG NO OF FREE UNITS = 1.2
MINIMUM PATROL INTERVAL = 32.2 HRS

TO CONTINUE, HIT RETURN
PRINT PAGE (Y/N) ? Y

PATROL/PLAN

OUTPUT SUMMARY - BLOCK 3: AFTERNOON

% OF PRIORITY 1 CALLS DELAYED IN QUEUE = 42.0
% OF PRIORITY 2 CALLS DELAYED IN QUEUE = 42.0
% OF PRIORITY 3 CALLS DELAYED IN QUEUE = 42.0
AVG NO OF CALLS IN QUEUE = 1.0

PRIORITY LEVEL	QUEUE DELAY	TRAVEL TIME	RESPONSE TIME
1	6.3	6.4	12.8
2	18.4	6.4	24.8
3	50.0	6.4	56.4
AVG	17.2	6.4	23.7

GO TO PAGE ? 6 BLOCK ? NIGHT
PRINT PAGE (Y/N) ? Y

PATROL/PLAN

CONSTRAINTS - BLOCK 1: NIGHT

1 ACTUAL CFS WORK/UNIT (MIN/HR)
2 UNCOMMITTED TIME/UNIT (MIN/HR)
3 AVG NO OF FREE UNITS
4 MINIMUM PATROL INTERVAL (HRS)
5 PERCENT CALLS - ALL UNITS BUSY
6 QUEUE DELAY (MIN)
7 TRAVEL TIME (MIN)
8 RESPONSE TIME (MIN)

CONSTRAINT NO ? 2

INPUT LOWER LIMIT ? 20

ANOTHER CONSTRAINT (Y/N) ? Y

PRINT PAGE (Y/N) ? Y

PATROL/PLAN

CONSTRAINTS - BLOCK 1: NIGHT

1 ACTUAL CFS WORK/UNIT (MIN/HR)
2 UNCOMMITTED TIME/UNIT (MIN/HR)
3 AVG NO OF FREE UNITS
4 MINIMUM PATROL INTERVAL (HRS)
5 PERCENT CALLS - ALL UNITS BUSY
6 QUEUE DELAY (MIN)
7 TRAVEL TIME (MIN)
8 RESPONSE TIME (MIN)

CONSTRAINT NO ? 5

INPUT UPPER LIMIT ? 5

ANOTHER CONSTRAINT (Y/N) ? Y

PRINT PAGE (Y/N) ? Y

PATROL/PLAN

CONSTRAINTS - BLOCK 1: NIGHT

1 ACTUAL CFS WORK/UNIT (MIN/HR)
2 UNCOMMITTED TIME/UNIT (MIN/HR)
3 AVG NO OF FREE UNITS
4 MINIMUM PATROL INTERVAL (HRS)
5 PERCENT CALLS - ALL UNITS BUSY
6 QUEUE DELAY (MIN)
7 TRAVEL TIME (MIN)
8 RESPONSE TIME (MIN)

CONSTRAINT NO ? 4

INPUT UPPER LIMIT ? 8

ANOTHER CONSTRAINT (Y/N) ? Y

PRINT PAGE (Y/N) ? Y

PATROL/PLAN

CONSTRAINTS - BLOCK 1: NIGHT

1 ACTUAL CFS WORK/UNIT (MIN/HR)
2 UNCOMMITTED TIME/UNIT (MIN/HR)
3 AVG NO OF FREE UNITS
4 MINIMUM PATROL INTERVAL (HRS)
5 PERCENT CALLS - ALL UNITS BUSY
6 QUEUE DELAY (MIN)
7 TRAVEL TIME (MIN)
8 RESPONSE TIME (MIN)

CONSTRAINT NO ? 8
AVG (0) OR PRIORITY (1, 2, OR 3) ? 0
INPUT UPPER LIMIT ? 5

ANOTHER CONSTRAINT (Y/N) ? N

PRINT PAGE (Y/N) ? Y

PATROL/PLAN

BLOCK 1: NIGHT	LIMIT	VALUE	NO OF UNITS
UNCOMMITTED TIME/ UNIT (MIN/HR)	20.0	50.5	1
MINIMUM PATROL INTERVAL (HRS)	8.0	7.2	5 **
PERCENT CALLS - ALL UNITS BUSY	5.0	0.1	3
AVG RESPONSE TIME (MIN)	5.0	4.4	5 **

RUN COMPLETED. 5 UNITS NOW ASSIGNED
TO BLOCK 1: NIGHT
SAME LIMITS, ANOTHER BLOCK (Y/N) ? Y
BLOCK ? DAY
PRINT PAGE (Y/N) ? Y

PATROL/PLAN

BLOCK 2: DAY

	LIMIT	VALUE	NO OF UNITS	
UNCOMMITTED TIME/ UNIT (MIN/HR)	20.0	47.9	2	
MINIMUM PATROL INTERVAL (HRS)	8.0	7.4	9	**
PERCENT CALLS - ALL UNITS BUSY	5.0	0.0	5	
AVG RESPONSE TIME (MIN)	5.0	4.5	8	

RUN COMPLETED. 9 UNITS NOW ASSIGNED
TO BLOCK 2: DAY
SAME LIMITS, ANOTHER BLOCK (Y/N) ? Y
BLOCK ? AFTERNOON
PRINT PAGE (Y/N) ? Y

PATROL/PLAN

BLOCK 3: AFTERNOON

	LIMIT	VALUE	NO OF UNITS	
UNCOMMITTED TIME/ UNIT (MIN/HR)	20.0	37.7	5	
MINIMUM PATROL INTERVAL (HRS)	8.0	7.0	9	**
PERCENT CALLS - ALL UNITS BUSY	5.0	0.8	7	
AVG RESPONSE TIME (MIN)	5.0	3.2	7	

RUN COMPLETED. 9 UNITS NOW ASSIGNED
TO BLOCK 3: AFTERNOON
SAME LIMITS, ANOTHER BLOCK (Y/N) ? N
GO TO PAGE ? 3 BLOCK ? DAY
PRINT PAGE (Y/N) ? Y

PATROL/PLAN

INPUT DATA - BLOCK 2: DAY

1	BLOCK NAME	9	REGION AREA
2	NO OF UNITS	10	RESPONSE SPEEDS
3	CALL RATE	11	PATROLLED STREETS
4	NO OF UNITS/CFS	12	PATROL SPEED
5	SERVICE TIMES	13	COPY ANOTHER BLOCK
6	NON-CFS TIME/ UNIT	14	INPUT ALL DATA ITEMS
7	DISPATCH POLICY	15	CHANGE PRINT OPTION
8	% CFS/PRIORITY		

INPUT DATA ITEM NO ? 7
DISPATCH POLICY = 2 (BACKUP FOR PRIORITY
1 CALLS ONLY)
NEW VALUE ? 3
PRINT PAGE (Y/N) ? Y

PATROL/PLAN

INPUT DATA - BLOCK 2: DAY

1	BLOCK NAME	9	REGION AREA
2	NO OF UNITS	10	RESPONSE SPEEDS
3	CALL RATE	11	PATROLLED STREETS
4	NO OF UNITS/CFS	12	PATROL SPEED
5	SERVICE TIMES	13	COPY ANOTHER BLOCK
6	NON-CFS TIME/ UNIT	14	INPUT ALL DATA ITEMS
7	DISPATCH POLICY	15	CHANGE PRINT OPTION
8	% CFS/PRIORITY		

INPUT DATA ITEM NO ? 0

GO TO PAGE ? 6 BLOCK ?
PRINT PAGE (Y/N) ? Y

THE INSTITUTE FOR PUBLIC PAGE 6
PROGRAM ANALYSIS

PATROL/PLAN

CONSTRAINTS - BLOCK 2: DAY

1 ACTUAL CFS WORK/UNIT (MIN/HR)
2 UNCOMMITTED TIME/UNIT (MIN/HR)
3 AVG NO OF FREE UNITS
4 MINIMUM PATROL INTERVAL (HRS)
5 PERCENT CALLS - ALL UNITS BUSY
6 QUEUE DELAY (MIN)
7 TRAVEL TIME (MIN)
8 RESPONSE TIME (MIN)

CONSTRAINT NO ? 2

INPUT LOWER LIMIT ? 20

ANOTHER CONSTRAINT (Y/N) ? Y

PRINT PAGE (Y/N) ? Y

THE INSTITUTE FOR PUBLIC PAGE 6
PROGRAM ANALYSIS

PATROL/PLAN

CONSTRAINTS - BLOCK 2: DAY

1 ACTUAL CFS WORK/UNIT (MIN/HR)
2 UNCOMMITTED TIME/UNIT (MIN/HR)
3 AVG NO OF FREE UNITS
4 MINIMUM PATROL INTERVAL (HRS)
5 PERCENT CALLS - ALL UNITS BUSY
6 QUEUE DELAY (MIN)
7 TRAVEL TIME (MIN)
8 RESPONSE TIME (MIN)

CONSTRAINT NO ? 5

INPUT UPPER LIMIT ? 5

ANOTHER CONSTRAINT (Y/N) ? Y

PRINT PAGE (Y/N) ? Y

THE INSTITUTE FOR PUBLIC PAGE 6
PROGRAM ANALYSIS

PATROL/PLAN

CONSTRAINTS - BLOCK 2: DAY

1 ACTUAL CFS WORK/UNIT (MIN/HR)
2 UNCOMMITTED TIME/UNIT (MIN/HR)
3 AVG NO OF FREE UNITS
4 MINIMUM PATROL INTERVAL (HRS)
5 PERCENT CALLS - ALL UNITS BUSY
6 QUEUE DELAY (MIN)
7 TRAVEL TIME (MIN)
8 RESPONSE TIME (MIN)

CONSTRAINT NO ? 4

INPUT UPPER LIMIT ? 8

ANOTHER CONSTRAINT (Y/N) ? Y

PRINT PAGE (Y/N) ? Y

THE INSTITUTE FOR PUBLIC PAGE 6
PROGRAM ANALYSIS

PATROL/PLAN

CONSTRAINTS - BLOCK 2: DAY

1 ACTUAL CFS WORK/UNIT (MIN/HR)
2 UNCOMMITTED TIME/UNIT (MIN/HR)
3 AVG NO OF FREE UNITS
4 MINIMUM PATROL INTERVAL (HRS)
5 PERCENT CALLS - ALL UNITS BUSY
6 QUEUE DELAY (MIN)
7 TRAVEL TIME (MIN)
8 RESPONSE TIME (MIN)

CONSTRAINT NO ? 8
AVG (0) OR PRIORITY (1, 2, OR 3) ? 0
INPUT UPPER LIMIT ? 5

ANOTHER CONSTRAINT (Y/N) ? N

PRINT PAGE (Y/N) ? Y

THE INSTITUTE FOR PUBLIC PAGE 6
PROGRAM ANALYSIS

PATROL/PLAN

CONSTRAINTS - BLOCK 2: DAY

1 ACTUAL CFS WORK/UNIT (MIN/HR)
2 UNCOMMITTED TIME/UNIT (MIN/HR)
3 AVG NO OF FREE UNITS
4 MINIMUM PATROL INTERVAL (HRS)
5 PERCENT CALLS - ALL UNITS BUSY
6 QUEUE DELAY (MIN)
7 TRAVEL TIME (MIN)
8 RESPONSE TIME (MIN)

CONSTRAINT NO ? 2

INPUT LOWER LIMIT ? 20

ANOTHER CONSTRAINT (Y/N) ? Y

PRINT PAGE (Y/N) ? Y

THE INSTITUTE FOR PUBLIC PAGE 6
PROGRAM ANALYSIS

PATROL/PLAN

CONSTRAINTS - BLOCK 2: DAY

1 ACTUAL CFS WORK/UNIT (MIN/HR)
2 UNCOMMITTED TIME/UNIT (MIN/HR)
3 AVG NO OF FREE UNITS
4 MINIMUM PATROL INTERVAL (HRS)
5 PERCENT CALLS - ALL UNITS BUSY
6 QUEUE DELAY (MIN)
7 TRAVEL TIME (MIN)
8 RESPONSE TIME (MIN)

CONSTRAINT NO ? 5

INPUT UPPER LIMIT ? 5

ANOTHER CONSTRAINT (Y/N) ? Y

PRINT PAGE (Y/N) ? Y

PATROL/PLAN

BLOCK 2: DAY	LIMIT	VALUE	NO OF UNITS	
UNCOMMITTED TIME/ UNIT (MIN/HR)	20.0	47.9	3	
MINIMUM PATROL INTERVAL (HRS)	8.0	7.4	9	**
PERCENT CALLS - ALL UNITS BUSY	5.0	0.0	5	
AVG RESPONSE TIME (MIN)	5.0	4.5	8	

RUN COMPLETED. 9 UNITS NOW ASSIGNED
TO BLOCK 2: DAY
SAME LIMITS, ANOTHER BLOCK (Y/N) ? N
GO TO PAGE ? 3 BLOCK ? NIGHT
PRINT PAGE (Y/N) ? Y

PATROL/PLAN

INPUT DATA - BLOCK 1: NIGHT

1	BLOCK NAME	9	REGION AREA
2	NO OF UNITS	10	RESPONSE SPEEDS
3	CALL RATE	11	PATROLLED STREETS
4	NO OF UNITS/CFS	12	PATROL SPEED
5	SERVICE TIMES	13	COPY ANOTHER BLOCK
6	NON-CFS TIME/ UNIT	14	INPUT ALL DATA ITEMS
7	DISPATCH POLICY	15	CHANGE PRINT OPTION
8	% CFS/PRIORITY		

INPUT DATA ITEM NO ? 3
CALL RATE = 1.14 CFS/HR
NEW VALUE ? 1.27

PRINT PAGE (Y/N) ? Y

PATROL/PLAN

INPUT DATA - BLOCK 1: NIGHT

1	BLOCK NAME	9	REGION AREA
2	NO OF UNITS	10	RESPONSE SPEEDS
3	CALL RATE	11	PATROLLED STREETS
4	NO OF UNITS/CFS	12	PATROL SPEED
5	SERVICE TIMES	13	COPY ANOTHER BLOCK
6	NON-CFS TIME/ UNIT	14	INPUT ALL DATA ITEMS
7	DISPATCH POLICY	15	CHANGE PRINT OPTION
8	% CFS/PRIORITY		

INPUT DATA ITEM NO ? 0

GO TO PAGE ? 3 BLOCK ? DAY
PRINT PAGE (Y/N) ? Y

PATROL/PLAN

INPUT DATA - BLOCK 2: DAY

1	BLOCK NAME	9	REGION AREA
2	NO OF UNITS	10	RESPONSE SPEEDS
3	CALL RATE	11	PATROLLED STREETS
4	NO OF UNITS/CFS	12	PATROL SPEED
5	SERVICE TIMES	13	COPY ANOTHER BLOCK
6	NON-CFS TIME/ UNIT	14	INPUT ALL DATA ITEMS
7	DISPATCH POLICY	15	CHANGE PRINT OPTION
8	% CFS/PRIORITY		

INPUT DATA ITEM NO ? 3
CALL RATE = 1.52 CFS/HR
NEW VALUE ? 1.70

PRINT PAGE (Y/N) ? Y

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          THE INSTITUTE FOR PUBLIC  PAGE 3
              PROGRAM ANALYSIS

                  PATROL/PLAN

INPUT DATA - BLOCK 2: DAY

1 BLOCK NAME          9 REGION AREA
2 NO OF UNITS        10 RESPONSE SPEEDS
3 CALL RATE          11 PATROLLED STREETS
4 NO OF UNITS/CFS    12 PATROL SPEED
5 SERVICE TIMES      13 COPY ANOTHER BLOCK
6 NON-CFS TIME/      14 INPUT ALL DATA
  UNIT                  ITEMS
7 DISPATCH POLICY    15 CHANGE PRINT
8 % CFS/PRIORITY        OPTION


INPUT DATA ITEM NO ? 7
DISPATCH POLICY = 3 (NO BACKUP UNITS)
NEW VALUE ? 2

PRINT PAGE (Y/N) ? Y
```



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          THE INSTITUTE FOR PUBLIC  PAGE 3
              PROGRAM ANALYSIS

                  PATROL/PLAN

INPUT DATA - BLOCK 2: DAY

1 BLOCK NAME          9 REGION AREA
2 NO OF UNITS        10 RESPONSE SPEEDS
3 CALL RATE          11 PATROLLED STREETS
4 NO OF UNITS/CFS    12 PATROL SPEED
5 SERVICE TIMES      13 COPY ANOTHER BLOCK
6 NON-CFS TIME/      14 INPUT ALL DATA
  UNIT                  ITEMS
7 DISPATCH POLICY    15 CHANGE PRINT
8 % CFS/PRIORITY        OPTION


INPUT DATA ITEM NO ? 0


GO TO PAGE ? 3          BLOCK ? AFTERNOON
PRINT PAGE (Y/N) ? Y
```



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          THE INSTITUTE FOR PUBLIC  PAGE 3
              PROGRAM ANALYSIS

                  PATROL/PLAN

INPUT DATA - BLOCK 3: AFTERNOON

1 BLOCK NAME          9 REGION AREA
2 NO OF UNITS        10 RESPONSE SPEEDS
3 CALL RATE          11 PATROLLED STREETS
4 NO OF UNITS/CFS    12 PATROL SPEED
5 SERVICE TIMES      13 COPY ANOTHER BLOCK
6 NON-CFS TIME/      14 INPUT ALL DATA
  UNIT                  ITEMS
7 DISPATCH POLICY    15 CHANGE PRINT
8 % CFS/PRIORITY        OPTION


INPUT DATA ITEM NO ? 3
CALL RATE = 2.77 CFS/HR
NEW VALUE ? 3.10

PRINT PAGE (Y/N) ? Y
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          THE INSTITUTE FOR PUBLIC  PAGE 3
              PROGRAM ANALYSIS

                  PATROL/PLAN

INPUT DATA - BLOCK 3: AFTERNOON

1 BLOCK NAME          9 REGION AREA
2 NO OF UNITS        10 RESPONSE SPEEDS
3 CALL RATE          11 PATROLLED STREETS
4 NO OF UNITS/CFS    12 PATROL SPEED
5 SERVICE TIMES      13 COPY ANOTHER BLOCK
6 NON-CFS TIME/      14 INPUT ALL DATA
  UNIT                  ITEMS
7 DISPATCH POLICY    15 CHANGE PRINT
8 % CFS/PRIORITY        OPTION


INPUT DATA ITEM NO ? 0


GO TO PAGE ? 7   PRINT PAGE (Y/N) ? Y
```

PATROL/PLAN

MULTIBLOCK ALLOCATION VARIABLES:

1 ACTUAL CFS WORK/UNIT (MIN/HR)
2 UNCOMMITTED TIME/UNIT (MIN/HR)
3 AVG NO OF FREE UNITS
4 MINIMUM PATROL INTERVAL (HRS)
5 PERCENT CALLS - ALL UNITS BUSY
6 QUEUE DELAY (MIN)
7 TRAVEL TIME (MIN)
8 RESPONSE TIME (MIN)

ALLOCATION VARIABLE ? 4

PRINT PAGE (Y/N) ? Y

PATROL/PLAN

ALLOCATION VARIABLE:
MINIMUM PATROL INTERVAL (HRS)

TOTAL NO OF UNITS TO BE ALLOCATED ? 15

ENTER NO OF UNITS THAT CAN BE
ALLOCATED TO:

BLOCK 1:	NIGHT	MIN ? 4	MAX ? 15
BLOCK 2:	DAY	MIN ? 4	MAX ? 15
BLOCK 3:	AFTERNOON	MIN ? 4	MAX ? 15

ALLOCATION PROCEDURE: MIN AVG (1) OR
MIN MAX (2) ? 2

PRINT PAGE (Y/N) ? Y

ALLOCATION VARIABLE: PAGE 7
MINIMUM PATROL INTERVAL (HRS)

ALLOCATION PROCEDURE: MIN MAX

	BLOCK	NO OF UNITS MIN	ADD	TOTAL	OUTPUT VALUE	UNIT CHANGE
1	NIGHT	4	0	4	9.5	-2.2
2	DAY	4	1	5	16.4	-3.7
3	AFTERNOON	4	2	6	14.5	-3.6
	TOTAL	12	3	15*	13.5	-1.2

RUN COMPLETED. NO OF UNITS ASSIGNED TO
BLOCKS ARE UPDATED.
REPEAT ALLOCATION WITH MIN AVG
PROCEDURE (Y/N)? N
GO TO PAGE ? 7 PRINT PAGE (Y/N) ? Y

PATROL/PLAN

MULTIBLOCK ALLOCATION VARIABLES:

1 ACTUAL CFS WORK/UNIT (MIN/HR)
2 UNCOMMITTED TIME/UNIT (MIN/HR)
3 AVG NO OF FREE UNITS
4 MINIMUM PATROL INTERVAL (HRS)
5 PERCENT CALLS - ALL UNITS BUSY
6 QUEUE DELAY (MIN)
7 TRAVEL TIME (MIN)
8 RESPONSE TIME (MIN)

ALLOCATION VARIABLE ? 4

PRINT PAGE (Y/N) ? Y

PATROL/PLAN

ALLOCATION VARIABLE:
MINIMUM PATROL INTERVAL (HRS)

TOTAL NO OF UNITS TO BE ALLOCATED ? 15

ENTER NO OF UNITS THAT CAN BE
ALLOCATED TO:

BLOCK 1: NIGHT	MIN ? 0	MAX ? 15
BLOCK 2: DAY	MIN ? 0	MAX ? 15
BLOCK 3: AFTERNOON	MIN ? 0	MAX ? 15

ALLOCATION PROCEDURE: MIN AVG (1) OR
MIN MAX (2) ? 2

PRINT PAGE (Y/N) ? Y

ALLOCATION PROCEDURE: MIN MAX

	BLOCK	NO OF UNITS MIN	ADD	TOTAL	OUTPUT VALUE	UNIT CHANGE
1	NIGHT	1	2	3	13.7	-4.2
2	DAY	2	4	6	12.7	-2.3
3	AFTERNOON	3	3	6	14.5	-3.6
	TOTAL	6	9	15*	13.6	-1.2

RUN COMPLETED. NO OF UNITS ASSIGNED TO
BLOCKS ARE UPDATED.
REPEAT ALLOCATION WITH MIN AVG
PROCEDURE (Y/N) ? Y
PRINT PAGE (Y/N) ? Y

ALLOCATION PROCEDURE: MIN AVG

	BLOCK	NO OF UNITS MIN	ADD	TOTAL	OUTPUT VALUE	UNIT CHANGE
1	NIGHT	1	3	4	9.5	-2.2
2	DAY	2	3	5	16.4	-3.7
3	AFTERNOON	3	3	6	14.5	-3.6
	TOTAL	6	9	15*	13.5	-1.2

RUN COMPLETED. NO OF UNITS ASSIGNED TO
BLOCKS ARE UPDATED.
REPEAT ALLOCATION WITH MIN MAX
PROCEDURE (Y/N)? N
GO TO PAGE ? 0 STOP PROGRAM (Y/N) ? Y
PRINT PAGE (Y/N) ? Y

APPENDIX E

SOLUTIONS TO BEAT DESIGN EXERCISES

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Exercise 7: Use the BEAT/PLAN program to create a data file containing the area, patrolled streets, and unit-minutes expended on calls for service on each shift for the 29 reporting areas in Law City (see Table 5-1). Verify that the data has been correctly entered and save the file on disk.

The solution to Exercise 7 is illustrated in Displays 1 through 80 in Section C of Chapter III in the BEAT/PLAN user's manual. The contents of each display are explained in Section B of that chapter.

Exercise 8: Use the BEAT/PLAN Program to define the current four-beat configuration for Law City (see Figure 2-2). Display the four-beat plan and verify that no reporting areas have been omitted or assigned to more than one beat. Save the beat plan on disk.

The solution to Exercise 8 is illustrated in Displays 81 through 105 in the BEAT/PLAN user's manual. (Note that in these displays, some errors were intentionally made in entering the beat plan to illustrate features for modifying a plan.)

Exercise 9: Use the data file created in Exercise 7 and the beat plan specified in Exercise 8 to compute additive beat characteristics for the current four-beat plan.

The solution to Exercise 9 is illustrated in Displays 1 through 15 at the end of this appendix. The steps illustrated include the following:

- The BEAT/PLAN analysis is initiated by entering the command RUN BEAT/PLAN. The title page is displayed (Display 1), a print option is selected (Display 2), and the table of contents is displayed (Display 3). Page 2 is selected.
- The reporting area data is entered from the file created in Exercise 7 (Displays 4 and 5). Page 4 is selected.

Preceding page blank

- The current four-beat plan is entered from the file created in Exercise 8 (Displays 6, 7, and 8).

- Page 5 is selected (Display 9) and additive beat characteristics are computed and displayed for the current four-beat plan (Displays 10 through 15).

Exercise 10: Enter reporting area adjacency data from the file LAWCITY ADJ. List the data and verify that it agrees with the adjacency data in Table 5-2. Use BEAT/PLAN'S prescriptive capabilities to suggest modifications to the current four-beat plan to balance CFS workload by beat on the night shift. Display the additive beat characteristics based on data items 1, 2, and 3 for the new plan suggested by BEAT/PLAN.

The solution to Exercise 10 is illustrated in Displays 16 through 37 at the end of this appendix. The steps illustrated include the following:

- Reporting area adjacency data is entered from the file LAWCITY ADJ using option 1 on page 7 (Displays 16, 17, and 18).

- The adjacency data is listed using option 2 on page 7 (Displays 19 through 25).

- Option 5 is used to modify the beat plan to balance CFS workload on the Night shift among the four beats (Displays 26 through 30).

- The resulting beat plan is displayed using option 4 (Displays 31 through 32).

- Page 5 is selected (Display 33) and additive beat characteristics are displayed for the modified beat plan (Displays 34 through 37).

Exercise 11: Enter the geographic data from the file LAWCITY GEO DATA. List the data and verify that it agrees with the data shown in Table 5-3. Use BEAT/PLAN to compute non-additive performance characteristics for the city, and for each unit and beat with the new beat plan produced in Exercise 10. Assume that the call rate is 1.14 calls per hour, that the average service time per call is 33 minutes, and that the average number of non-CFS minutes per hour per unit is 12 minutes. Assume also that calls arriving when all units are busy are queued, and that the unit assigned to the beat in which a call occurs is always dispatched if available. The average response speed and patrol speed are 18.6 and 10.7 miles per hour, respectively.

The solution to Exercise 11 is illustrated in Displays 38 through 48 at the end of this appendix. The steps in the solution include the following:

- Geographic data is entered from the file LAWCITY GEO DATA using option 2 on page 2 (Display 38 and 39).

- This data can be listed using option 1 or 2 on page 3. (This step is not illustrated in the displays.)

- Input data describing workload and patrol operations are entered (Display 40), and non-additive performance characteristics are computed and displayed for the region (Displays 41 and 42), for each beat (Displays 43, 44, and 45), and for each unit (Displays 46, 47, and 48).

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*                                    *
*                                    *
*          B E A T / P L A N         *
*                                    *
*                                    *
*             OCTOBER 1979           *
*                                    *
*       THE INSTITUTE FOR PUBLIC     *
*           PROGRAM ANALYSIS         *
*         ST. LOUIS, MISSOURI        *
*                                    *
*       DEVELOPED FOR THE NATIONAL   *
*    INSTITUTE OF LAW ENFORCEMENT AND *
*      CRIMINAL JUSTICE, L.E.A.A.,   *
*      U.S. DEPARTMENT OF JUSTICE.   *
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*                                    *
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Do You Want Printed Output? Y

1

BEAT/PLAN

PRINT OPTIONS:

1 DISPLAY ONLY
2 PRINT SPECIFIED PAGES ONLY
3 PRINT ALL OUTPUT

OPTION ?3

2

BEAT/PLAN

TABLE OF CONTENTS

PAGE

0 TERMINATE PROCESSING
1 DISPLAY TABLE OF CONTENTS
2 ENTER RPT AREA DATA
3 VERIFY/MODIFY/SAVE RPT AREA DATA
4 SPECIFY/MODIFY/DISPLAY/SAVE A BEAT PLAN
5 DISPLAY RPT AREA DATA AGGREGATED BY BEAT
6 DISPLAY REGION, BEAT, AND UNIT PERFORMANCE ESTIMATES
7 DISPLAY PRESCRIPTIVE BEAT PLAN MODIFICATIONS
8 MODIFY PRINT OPTION
9 INSERT COMMENTS INTO OUTPUT

Go To Page? 2

3

BEAT/PLAN

INPUT OPTIONS:

0 GO TO NEW PAGE
1 KEY IN NEW RPT AREA DATA
2 ENTER RPT AREA DATA FROM DISK
3 ADD RPT AREA DATA TO AN EXISTING DATA FILE

OPTION ?2

4

BEAT/PLAN

NAME OF DATA FILE TLAWCITY DATA

FILE CONTAINS: LAWCITY - RPT AREA DATA

NO OF RPT AREAS: 29

DATA ITEMS:

0: AREA ID 1: SQ MILES 2: STREETS
3: CFS-NITE 4: CFS-DAY 5: CFS-AFT

DATA HAS BEEN ENTERED

Go To Page? 4

5

BEAT/PLAN

OPTIONS:

0 GO TO NEW PAGE
1 ENTER BEAT PLAN
2 MODIFY BEAT PLAN
3 DISPLAY BEAT PLAN
4 SAVE BEAT PLAN ON DISK

OPTION ?1

6

BEAT/PLAN

MAXIMUM NO OF BEATS: 16

INPUT OPTIONS:

1 KEY IN NEW BEAT PLAN
2 ENTER BEAT PLAN FROM DISK

OPTION ?2

7

BEAT/PLAN

NAME OF BEAT PLAN TLAWCITY PLAN

FILE CONTAINS: LAWCITY - BEAT PLAN

NO OF BEATS: 4

BEAT PLAN HAS BEEN ENTERED

8

BEAT/PLAN

OPTIONS:

0 GO TO NEW PAGE
1 ENTER BEAT PLAN
2 MODIFY BEAT PLAN
3 DISPLAY BEAT PLAN
4 SAVE BEAT PLAN ON DISK

OPTION ?0

Go To Page? 5

BEAT/PLAN

DATA ITEMS:

0: AREA ID 1: SQ MILES 2: STREETS
3: CFS-NITE 4: CFS-DAY 5: CFS-AFT

NO OF DATA ITEMS, AGGREGATED
BY BEAT, TO BE DISPLAYED?5

DO YOU WANT TO COMPUTE
BEAT INDEX VALUES ?N

BEAT/PLAN

BEAT STATISTICS

BEAT NO	BEAT NAME	SQ MILES	% OF TOTAL
1	FIRST	5.51	36.01
2	SECOND	4.67	30.52
3	THIRD	2.76	18.04
4	FOURTH	2.36	15.42
	TOTAL	15.3	

BEAT/PLAN

BEAT STATISTICS

BEAT NO	BEAT NAME	STREETS	% OF TOTAL
1	FIRST	90.8	28.06
2	SECOND	88.7	27.43
3	THIRD	61.7	19.08
4	FOURTH	82.2	25.42
	TOTAL	323.4	

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PROGRAM ANALYSIS

BEAT/PLAN

BEAT STATISTICS

BEAT NO	BEAT NAME	CFS-NITE	% OF TOTAL
1	FIRST	396	23.53
2	SECOND	363	21.57
3	THIRD	297	17.65
4	FOURTH	627	37.25
	TOTAL	1683	

13

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PROGRAM ANALYSIS

BEAT/PLAN

BEAT STATISTICS

BEAT NO	BEAT NAME	CFS-DAY	% OF TOTAL
1	FIRST	849.6	23.53
2	SECOND	690.3	19.12
3	THIRD	477.9	13.24
4	FOURTH	1593	44.12
	TOTAL	3610.8	

14

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PROGRAM ANALYSIS

BEAT/PLAN

BEAT STATISTICS

BEAT NO	BEAT NAME	CFS-AFT	% OF TOTAL
1	FIRST	1255	20.16
2	SECOND	1054.2	16.94
3	THIRD	1556.2	25
4	FOURTH	2359.4	37.9
	TOTAL	6224.8	

Go To Page? 7

15

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PROGRAM ANALYSIS

BEAT/PLAN

OPTIONS AVAILABLE:

0 GO TO NEW PAGE
1 ENTER RPT AREA ADJACENCY DATA
2 VERIFY/MODIFY ADJACENCY DATA
3 SAVE ADJACENCY DATA ON DISK
4 DISPLAY BEAT PLAN
5 DISPLAY PRESCRIPTIVE BEAT PLAN MODIFICATIONS

OPTION ?1

16

BEAT/PLAN

INPUT OPTIONS:

1 KEY IN ADJACENCY DATA
2 ENTER ADJACENCY DATA FROM DISK

OPTION ?2

BEAT/PLAN

NAME OF FILE CONTAINING
RPT AREA ADJACENCY DATA TLAWCITY ADJ

FILE CONTAINS: LAWCITY ADJACENCIES

NO OF RPT AREAS: 29

ADJACENCY DATA HAS BEEN ENTERED

BEAT/PLAN

OPTIONS AVAILABLE:

0 GO TO NEW PAGE
1 ENTER RPT AREA ADJACENCY DATA
2 VERIFY/MODIFY ADJACENCY DATA
3 SAVE ADJACENCY DATA ON DISK
4 DISPLAY BEAT PLAN
5 DISPLAY PRESCRIPTIVE BEAT PLAN MODIFICATIONS

OPTION ?2

BEAT/PLAN

RPT AREA	ADJACENT RPT AREAS				
100	101	102	104	106	
101	100	102	103	105	
102	100	101	103	104	
103	101	102	105	110	
104	100	102			
105	101	103	106	108	110

CHANGE ?N

BEAT/PLAN

RPT AREA	ADJACENT RPT AREAS				
106	100	105	107	108	115
107	106	116	117	128	
108	105	106	110	114	115
109	110	112	113	114	
110	103	105	108	109	
111	112				

CHANGE TN

BEAT/PLAN

RPT AREA	ADJACENT RPT AREAS				
112	109	111	113	120	121
113	109	112	116	119	
114	108	109	115	116	
115	106	108	114	116	
116	107 118	113	114	115	117

CHANGE TN

BEAT/PLAN

RPT AREA	ADJACENT RPT AREAS				
117	107	116	118	128	
118	116	117	119	127	
119	113	118	120	125	126
120	112 125	119	121	122	124
121	112	120	122		

CHANGE TN

BEAT/PLAN

RPT AREA	ADJACENT RPT AREAS				
122	120	121	123		
123	122	124			
124	120	123	125		
125	119	120	124	126	
126	119	125	127		
127	118	126	128		

CHANGE TN

BEAT/PLAN

RPT
AREA ADJACENT RPT AREAS

128 107 117 127

CHANGE TN

BEAT/PLAN

OPTIONS AVAILABLE:

0 GO TO NEW PAGE
1 ENTER RPT AREA ADJACENCY DATA
2 VERIFY/MODIFY ADJACENCY DATA
3 SAVE ADJACENCY DATA ON DISK
4 DISPLAY BEAT PLAN
5 DISPLAY PRESCRIPTIVE BEAT PLAN MODIFICATIONS

OPTION T5

BEAT/PLAN

DATA ITEMS:

0:AREA ID 1:SQ MILES 2:STREETS
3:CFS-NITE 4:CFS-DAY 5:CFS-AFT

ITEM TO BE BALANCED T3

BEAT/PLAN

BEAT NO	BEAT NAME	CFS-NITE	% OF TOTAL
1	FIRST	396	23.53
2	SECOND	363	21.57
3	THIRD	297	17.65
4	FOURTH	627	37.25

DO YOU WANT TO CONSIDER CHANGES TY

SUGGESTED MODIFICATION:

MOVE AREA(S) 126
  FROM BEAT 4 TO BEAT 3

DO YOU WANT TO MAKE THIS CHANGE TY

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PROGRAM ANALYSIS

BEAT/PLAN

BEAT NO	BEAT NAME	CFS-NITE	% OF TOTAL
1	FIRST	396	23.53
2	SECOND	363	21.57
3	THIRD	528	31.37
4	FOURTH	396	23.53

DO YOU WANT TO CONSIDER CHANGES TY

SUGGESTED MODIFICATION:

MOVE AREA(S) 116
  FROM BEAT 3 TO BEAT 2

DO YOU WANT TO MAKE THIS CHANGE TY

THE INSTITUTE FOR PUBLIC PAGE 7
PROGRAM ANALYSIS

BEAT/PLAN

BEAT NO	BEAT NAME	CFS-NITE	% OF TOTAL
1	FIRST	396	23.53
2	SECOND	429	25.49
3	THIRD	462	27.45
4	FOURTH	396	23.53

DO YOU WANT TO CONSIDER CHANGES TY

CFS-NITE BALANCED

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PROGRAM ANALYSIS

BEAT/PLAN

OPTIONS:

  0 GO TO NEW PAGE
  1 ENTER RPT AREA ADJACENCY DATA
  2 VERIFY/MODIFY ADJACENCY DATA
  3 SAVE ADJACENCY DATA ON DISK
  4 DISPLAY BEAT PLAN
  5 DISPLAY PRESCRIPTIVE BEAT PLAN
     MODIFICATIONS

OPTION ? 4

THE INSTITUTE FOR PUBLIC PAGE 7
PROGRAM ANALYSIS

BEAT/PLAN

BEAT	RPT AREAS				
1	100	101	102	103	104
2	105	106	108	109	110
	114	115	116		
3	107	117	118	126	127
	128				
4	111	112	113	119	120
	121	122	123	124	125

BEAT/PLAN

OPTIONS:

0 GO TO NEW PAGE
1 ENTER RPT AREA ADJACENCY DATA
2 VERIFY/MODIFY ADJACENCY DATA
3 SAVE ADJACENCY DATA ON DISK
4 DISPLAY BEAT PLAN
5 DISPLAY PRESCRIPTIVE BEAT PLAN MODIFICATIONS

OPTION TO

Go To Page? 5

DATA ITEMS:

0: AREA ID 1: SQ MILES 2: STREETS
3: CFS-NITE 4: CFS-DAY 5: CFS-AFT

NO OF DATA ITEMS, AGGREGATED
BY BEAT, TO BE DISPLAYED?3

DO YOU WANT TO COMPUTE
BEAT INDEX VALUES ?N

FOR EACH DATA ITEM TO BE AGGREGATED,
ENTER THE FOLLOWING:

ITEM
NO

?1
?2
?3

BEAT/PLAN

BEAT STATISTICS

BEAT NO	BEAT NAME	SQ MILES	% OF TOTAL
1	FIRST	5.51	36.01
2	SECOND	4.92	32.16
3	THIRD	2.68	17.52
4	FOURTH	2.19	14.31
	TOTAL	15.3	

BEAT/PLAN

BEAT STATISTICS

BEAT NO	BEAT NAME	STREETS	% OF TOTAL
1	FIRST	90.8	28.08
2	SECOND	99.7	30.83
3	THIRD	57	17.63
4	FOURTH	75.9	23.47
	TOTAL	323.4	

BEAT/PLAN

BEAT STATISTICS

BEAT NO	BEAT NAME	CFS-NITE	% OF TOTAL
1	FIRST	396	23.53
2	SECOND	429	25.49
3	THIRD	462	27.45
4	FOURTH	396	23.53
	TOTAL	1683	

Go To Page? 2

BEAT/PLAN

INPUT OPTIONS:

0 GO TO NEW PAGE
1 KEY IN NEW RPT AREA DATA
2 ENTER RPT AREA DATA FROM DISK
3 ADD RPT AREA DATA TO AN EXISTING DATA FILE

OPTION T2

BEAT/PLAN

NAME OF DATA FILE TLAWCITY GEO DATA

FILE CONTAINS: LAWCITY - GEO DATA

NO OF RPT AREAS: 29

DATA ITEMS:

0: AREA ID 1: CALLS 2: X-COORD
3: Y-COORD 4: SQ MILES 5: ST MILES

DATA HAS BEEN ENTERED

Go To Page? 6

BEAT/PLAN

CALL RATE (CFS/HR)	T1.14
AVG SERVICE TIME PER CFS (MIN)	T33
AVG NO OF NON-CFS MIN/HR/UNIT	T12
CALLS QUEUED WHEN NO UNITS FREE	TY
PREFERENCE FOR BEAT UNIT IF FREE	TY
AVG RESPONSE SPEED (MPH)	T18.6
AVG PATROL SPEED (MPH)	T10.7

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PROGRAM ANALYSIS

BEAT/PLAN

DISPLAY OPTIONS:

0 GO TO NEW PAGE
1 DISPLAY REGION-WIDE PERFORMANCE ESTIMATES
2 DISPLAY BEAT PERFORMANCE ESTIMATES
3 DISPLAY UNIT PERFORMANCE ESTIMATES

OPTION T1

Computing Performance Estimates

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PROGRAM ANALYSIS

BEAT/PLAN

REGION PERFORMANCE ESTIMATES

WORKLOAD (MIN/HR)	21.41
RESP. TIME (MIN)	4.61
INTER-BEAT DISP. (%)	34.27
MIN PATROL INTERVAL (HR)	11.75

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PROGRAM ANALYSIS

BEAT/PLAN

DISPLAY OPTIONS:

0 GO TO NEW PAGE
1 DISPLAY REGION-WIDE PERFORMANCE ESTIMATES
2 DISPLAY BEAT PERFORMANCE ESTIMATES
3 DISPLAY UNIT PERFORMANCE ESTIMATES

OPTION T2

PROGRAM ANALYSIS

BEAT/PLAN

BEAT PERFORMANCE ESTIMATES

BEAT NO	1	2	3
BEAT NAME	FIRST	SECOND	THIRD
WORKLOAD (MIN/HR)	20.15	21.83	23.5
RESP. TIME (MIN)	5.51	4.31	3.97
INTER-BEAT DISP. (%)	30.68	36.19	36.81
MIN PATROL INTERVAL (HR)	12.45	15.02	8.68

PROGRAM ANALYSIS

BEAT/PLAN

BEAT PERFORMANCE ESTIMATES

BEAT NO	4
BEAT NAME	FOURTH
WORKLOAD (MIN/HR)	20.15
RESP. TIME (MIN)	4.76
INTER-BEAT DISP. (%)	32.83
MIN PATROL INTERVAL (HR)	10.76

BEAT/PLAN

DISPLAY OPTIONS:

0 GO TO NEW PAGE
1 DISPLAY REGION-WIDE PERFORMANCE ESTIMATES
2 DISPLAY BEAT PERFORMANCE ESTIMATES
3 DISPLAY UNIT PERFORMANCE ESTIMATES

OPTION T3

BEAT/PLAN

UNIT PERFORMANCE ESTIMATES

UNIT NO	1	2	3
UNIT NAME	FIRST	SECOND	THIRD
WORKLOAD (MIN/HR)	19.11	22.79	23.19
RESP. TIME (MIN)	5.15	4.57	4.06
INTER-BEAT DISP. (%)	26.36	39.11	36.28

BEAT/PLAN

UNIT PERFORMANCE ESTIMATES

UNIT NO	4
UNIT NAME	FOURTH
WORKLOAD (MIN/HR)	20.53
RESP. TIME (MIN)	4.76
INTER-BEAT DISP. (%)	33.91

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PROGRAM ANALYSIS

BEAT/PLAN

DISPLAY OPTIONS:

0 GO TO NEW PAGE
1 DISPLAY REGION-WIDE PERFORMANCE ESTIMATES
2 DISPLAY BEAT PERFORMANCE ESTIMATES
3 DISPLAY UNIT PERFORMANCE ESTIMATES

OPTION TO

Go To Page? 0

END