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Performance and Cost Decision-Making System
for the Field Policing Function

CALIFORNIA CONTRACT CITIES ASSOCIATION

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November 1972

BOOZ · ALLEN PUBLIC ADMINISTRATION SERVICES, Inc.

555 California Street
San Francisco · 94104
(415) 391-1900

November 15, 1972

Policy Advisory Committee
California Contract Cities Association
County of Los Angeles, California

Gentlemen:

We are pleased to submit our final report of the Phase II study for the California Contract Cities Association which provides and tests a performance and cost decision-making system for the field policing function. This report is the result of a team consulting effort composed of professional staff members of Booz, Allen Public Administration Services; Booz, Allen Applied Research; and John P. Kenney, Ph. D., Professor of Criminology.

This study was initiated after our Phase I report on the determination of law enforcement contractual cost was submitted in February 1971. The tentative objectives, scope and work tasks for the Phase II project were formulated, reviewed and modified from April through November in 1971 through discussions with representatives of the California Contract Cities Association and Law Enforcement Assistance Administration.

The final work plan was approved by the Policy Advisory Committee in December 1971. Detailed fact collection, analysis, and the development of study team recommendations took place from January through November in 1972. Four progress meetings were held with the Policy Advisory Committee in April, June, October and November during this eleven-month period to review and discuss findings, conclusions and recommendations.

In conducting this Phase II study, significant assistance and cooperation were received from various individuals and organizations, including:

- . The Pasadena, California Police Department and other city officials, particularly Robert H. McGowan, Police Chief, Thomas M. Winders, Deputy Police Chief, and John D. Phillips, City Manager.
- . The Law Enforcement Assistance Administration, particularly Lou Mayo and William Sprecher.
- . Peter J. Pitchess, Sheriff of Los Angeles County and members of his staff, particularly Stuart Hansell, Lieutenant.

We have appreciated this opportunity to work with you on the Phase II study.

Very truly yours,

*Booz, Allen Public
Administration Services, Inc.*

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SUMMARY

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The field policing function in medium-sized police departments provides a wide range of essential crime investigation, crime repression, community service and traffic control activities. Over half of departmental manpower and expenditures normally are committed to this basic policing function. Many police departments appear to need and would welcome assistance in improving their decision-making regarding the identification of meaningful service levels, documentation of resource requirements to achieve service objectives, and analysis of the benefit and costs of alternative approaches or methods for providing field policing services.

A performance and cost decision-making system has been developed to provide a methodology for strengthened managerial and operational planning, control, and evaluation of the field policing function. This system consists of fourteen analytical tasks, as summarized below:

- Task 1 - Forecasting the volume of community generated caseloads or called for services for the next planning year which could require police handling.
- Task 2 - Establishing quantitative and relevant service level objectives in the areas of crime investigation, community service, crime repression and traffic control which are quantifiable, measurable and capable of achievement, such as desired response times and other service level indices.

- Task 3 - Forecasting the volume of officer initiated workloads that could be generated, primarily crime repression and traffic control activities.
- Task 4 - Measuring the average time or man hours required to handle various types of anticipated work units like cases handled, reports written, arrests made, planned traffic enforcement and crime repression activities, and backup to other field units.
- Task 5 - Determining the estimated number of field man hours required to handle projected volumes for community generated and officer initiated workloads.
- Task 6 - Determining the projected field man hours which will be handled by different types of field units like patrol, traffic, and parking control cars.
- Task 7 - Determining the anticipated manpower availability for each classification of field personnel in terms of both average man hours available for field assignment and "street" duty for policemen, uniformed agents, sergeants and so on.
- Task 8 - Determining the number and classification of field personnel needed to handle forecasted workloads and resulting man hour requirements.
- Task 9 - Determining manpower costs by personnel classification for projected workload requirements, including salaries, fringe benefits, and special pay differentials.
- Task 10 - Determining annualized equipment costs for the type and number of equipment required, including depreciation and operating costs.
- Task 11 - Determining annualized occupancy costs for the field policing function based on space requirements, including depreciation and operating costs.

Task 12 - Determining other direct support or operating expense costs for the field policing function.

Task 13 - Comparing total estimated field policing costs with available funds, and, if financing levels are deemed insufficient and not likely to be expanded, reducing service level objectives and corresponding resource requirements.

Task 14 - Analyzing the benefits (advantages) and costs (disadvantages) of alternative approaches and methods for providing field policing services at acceptable service levels, of satisfactory quality, efficiently and economically.

The purpose, methodology, task completion responsibility and important considerations which affect decision-making in each of these analytical tasks are described, in detail, in this study.

A benefit and cost methodology to analyze alternative field policing approaches and methods has been formulated in the study. This methodology is structured to:

- . Define the nature of a field policing problem, including considerations which make it important, its current and future magnitude, groups affected, and possible causes.
- . Establish specific objectives, or end results desired, for reducing the problem, and measures to determine how well the problem is being reduced.
- . Identify tentative but viable alternative approaches or methods for achieving managerial or operating objectives.

- . Evaluate the possible benefits of each alternative, including a description of the criteria by which benefits were measured, quantification of potential benefits, and constraints of the benefit analysis.
- . Evaluate the possible costs of each alternative, including one-time and continuing costs and the unit costs of benefits if they can be computed.
- . Describe political or other significant factors and constraints which affect the choice among alternatives.
- . Recommend the alternative with the best benefit and cost ratio as well as any further analytical studies required to refine the benefit and cost evaluation further.

The application and usefulness of the benefit and cost methodology has been tested by evaluating alternative approaches in the Pasadena Police Department for attaining a reduced response time service level. In conducting this benefit and cost analysis:

- . Work measurement techniques were used to estimate expected control center processing times.
- . A queuing model was developed to estimate average and expected dispatching delay times because of the unavailability of a field unit.
- . A travel distance model was formulated to estimate average and expected travel times once field units were dispatched.

The benefits and costs of various alternatives were evaluated, including: (1) monitoring response times and making these results known; (2) adding field units; (3) changing dispatching policies; (4) establishing work output standards for control center processing; and (5) combining several alternatives. It was found that changing dispatching policies so that any field unit in either the north or south half of the city could be dispatched to a call in that area (rather than using quadrant dispatching) would provide the best benefit and cost ratio, as measured by the lowest annualized cost for each estimated minute of average response delay reduced.

The application and potential usefulness of the performance-cost decision-making system in determining police service levels and resource requirements, excluding benefit and cost analysis, has been tested in the cities of Pasadena (an independent city) and Commerce (a contract city) in Los Angeles County. Within existing data limitations, policing workloads have been forecasted, tentative service level objectives established, and field policing resource requirements determined. In addition, several candidate areas for benefit and cost analysis have been identified.

This study also has summarized the implications of the performance-cost decision-making system for cities in Los Angeles County who contract with the Sheriff's Department for police services.

I. INTRODUCTION

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In 1970, the California Contract Cities Association requested Booz, Allen & Hamilton to study the costs of policing services provided by the Los Angeles County Sheriff's Department to cities on a contractual basis. The study was titled "Determination of Law Enforcement Contractual Costs" and presented in February 1971. This initial, or Phase I report, and a detailed technical appendix also prepared provided: (1) an analysis of the functions and costs of operating the Sheriff's Department; (2) a methodology for allocating these costs among organizations and service units based on the legal responsibilities of the Sheriff, policies in providing countywide services, and costing philosophies; and (3) a pricing system for providing these services to contract cities.

A Phase II study involving a possible cost-effective model for police services also was authorized at the request of the Institute for Law Enforcement and the Administration of Justice of the Law Enforcement Assistance Administration as a condition for its financing of the Phase I study. The original study scope of this Phase II analytical effort was redefined in cooperation with the Institute and California Contract Cities Association to provide for the development and testing of a performance-cost decision-making system for the field policing function.

The Phase II report represents, in part, a case study of the field operations of the Pasadena Police Department. This case study was structured to analyze the nature and types of field policing services provided, workloads and manpower utilization, steps taken to improve field services, and how decisions were made regarding service levels and field policing resource requirements. Based on this case study and other relevant research studies on field policing, a performance-cost decision-making system was designed to assist medium-sized police departments in: (1) identifying field policing service levels and measures; (2) determining manpower and cost requirements to achieve service levels and objectives; and (3) analyzing the benefits and costs of alternative approaches and methods for providing field policing services.

Once this performance-cost decision-making methodology was developed, it was tested, on a summary basis, for the cities of Pasadena and Commerce, California. In addition, the methodology proposed for analyzing the benefits and costs of police service approaches was tested by evaluating alternative ways of reducing response times in Pasadena. Finally, the implications of this performance-cost decision-making system for contract cities in Los Angeles County were assessed.

1. Background Of The Study

The system for contractual law enforcement in Los Angeles County began in 1954 when the City of Lakewood incorporated and chose to retain the services of the Sheriff's Department for the performance of its policing functions. The Lakewood officials perceived this system as a means of taking advantage of the capabilities and professional services of the Sheriff's Department, avoiding costly development and duplication of police services, and, at the same time, retaining home rule over the police function. The contract plan provided a vehicle by which a city could set the level and type of services desired, except that the Sheriff, by virtue of his responsibility to assure that there is no breakdown of law enforcement in the county, reserved the right to establish the minimum service level the department would provide. Since the inception of the contractual law enforcement system, most newly incorporated cities have taken advantage of this police service approach.

An increasing concern of cities with their own police departments and cities policed under contract has been a means for determining levels of service and resulting resource requirements. Basically, the level of police services has been established by the professional judgment of the responsible public officials, based upon subjective evaluation of traditional crime and service data available, as well as previous services and resources provided. More definitive criteria and quantification of data dealing with service levels and resource needs generally have been lacking.

Since the contractual system for law enforcement is based primarily on the purchase of field policing units with most other support services (except detective backup) incorporated into the unit price, it was determined that analysis of the field policing functions could provide a meaningful approach for determining a level and resource needs for police services. Both the independent and contract cities in Los Angeles County potentially could benefit from the study since the field policing function usually constitutes over 50% of police department costs. Furthermore, the bulk of police work, particularly that associated with crime and traffic control as well as other service requests from citizens, takes place in the field.

In refining the scope of the project, it was concluded that the study should be structured to help identify and solve existing management or operating problems associated with field policing operations of immediate concern to cities in Los Angeles County and the Los Angeles County Sheriff's Department. It was concluded also that this study should present and demonstrate the utility of both the logic system and analytical techniques associated with benefit and cost analysis, particularly the establishment and use of more meaningful performance measures for field policing services and evaluation of alternative strategies for achieving improved service performance.

In addition, it was determined that the findings and recommendations which could result from the study would be presented in a format which was understandable and usable by city officials and police administrators.

2. Objectives Of The Study

The two major objectives for the Phase II project which emerged were as follows:

- . The development and testing of a decision-making system which would assist cities in Los Angeles County in determining an appropriate level of basic police service to be purchased or provided.
- . The description and demonstration of how cost-benefit approaches and methodologies can be employed in the analysis of alternatives for achieving a desired level of basic police service at the lowest possible cost.

3. Methodology Of The Study

A case study approach was selected as the most feasible and practical methodology for conducting the Phase II project. This approach provided a means of dealing with the real world of policing, whereby theoretical concepts and analytical technologies could be applied to an existing organization and its field policing operations. Thus, anticipated findings and results from the study could have more immediate application to other police departments.

The Pasadena Police Department in California was selected for the case study for the following reasons:

- . The demographic nature of the city was such that it met the specifications of a city in a complex urban setting. Its population included a large minority population, it had a mix of light industry business and residences and its population of slightly over 100,000 placed it still in a medium-sized city class.
- . The policing problems in Pasadena were such as to represent all facets of the crime problem and police service expectations in a city.
- . The police department also was large enough, with over 250 personnel, in terms of organization and operations such as to provide a mix of field policing approaches and methods.

Of equal or greater importance was the fact that the Police Chief, Robert McGowan, and Deputy Chief, Thomas Winders, with the support of the City Manager, John Phillips, were stimulated and intrigued by the prospects of the study and willing to commit their time and that of their staffs to the conduct of the case study aspect of the project. Moreover, these managerial personnel as well as other staff members are characterized by their open-mindedness in considering new information and ideas, willingness to experiment with different policing approaches and methods, and candor in analyzing and discussing existing policing problems, practices and needs. Without this attitudinal environment, the case study approach would not have worked.

The case study approach involving the Pasadena Police Department was supplemented with other fact collection and analytical approaches including:

- . The development and review of a questionnaire sent to over 50 police departments in California serving cities in the 50,000 to 150,000 population range.
- . Visits to and discussions with police personnel in other departments, including those in the cities of Phoenix, Los Angeles, Sunnyvale, Long Beach, and Pomona, and the Los Angeles County Sheriff's Department.
- . Review and analysis of various and recent research efforts and projects pertaining to the field policing function as well as other literature available.
- . The development and use of work measurement techniques, a specific computer program to collect and process for review performance and workload data for field policing units in Pasadena, and queuing and travel distance models for analyzing the benefit and costs of alternative strategies for reducing policing response times.

The findings and conclusions reached in the Phase II study have been incorporated into the performance-cost decision-making system and testings of its application are presented in this report.

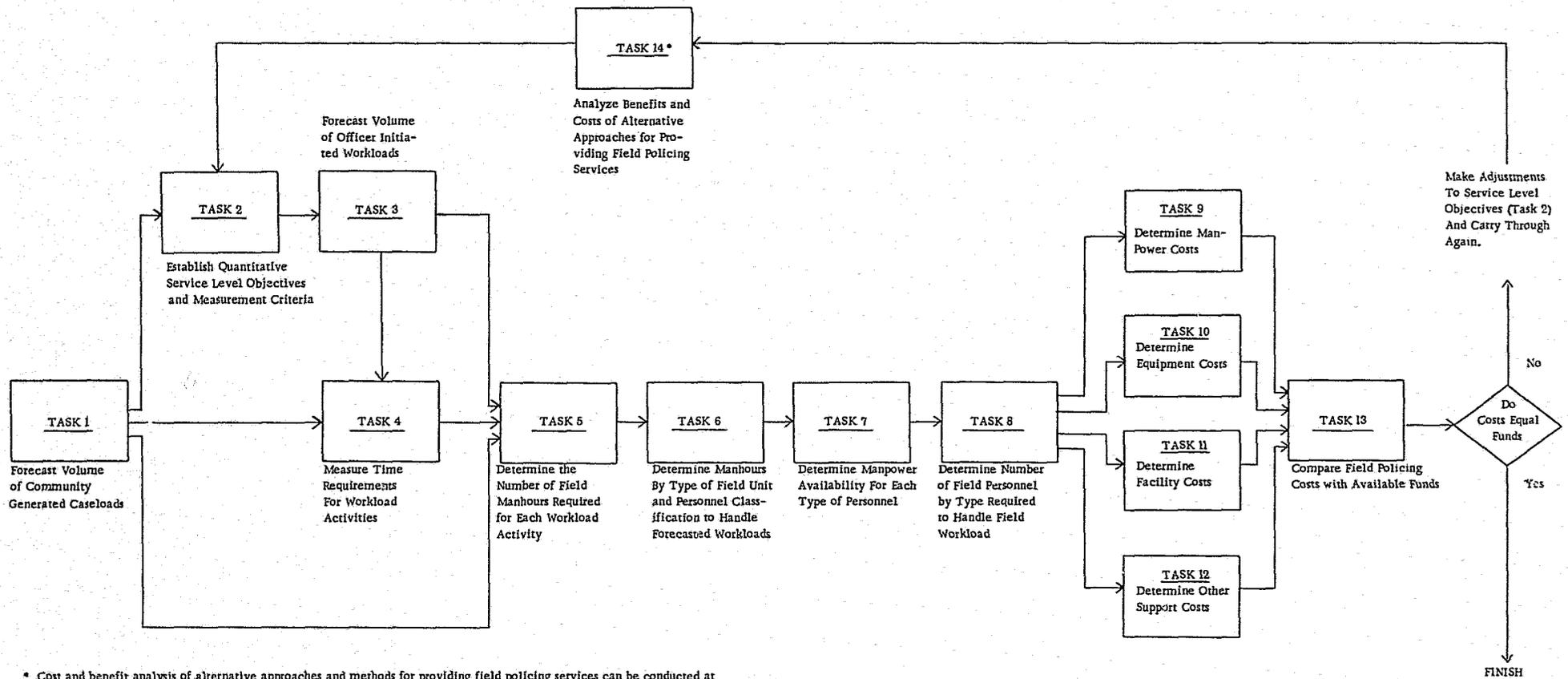
II. PERFORMANCE-COST DECISION-MAKING
SYSTEM FOR THE FIELD POLICING FUNCTION

II. PERFORMANCE-COST DECISION-MAKING SYSTEM FOR THE FIELD POLICING FUNCTION

This chapter of the report presents the conceptual design of a decision-making system for use by medium-sized police departments in: (1) determining service levels for the field policing function; (2) documenting the resource requirements, primarily manpower and associated costs, for achieving desired service levels; and (3) continually analyzing the potential benefits and costs of alternative approaches and methods for providing field policing services. The conceptual design of this performance-cost decision-making system is set forth in flow chart form in Exhibit I, following this page, and consists of 14 related analytical tasks. A description of each of these analytical tasks in terms of its purpose, methodology, task responsibility, and important considerations which can affect decision-making in completing the task is set forth in the sections below.

It should be emphasized that this decision-making system encompasses only those activities associated with field policing, primarily patrol and traffic enforcement. However, the general logic flow and some of the analytical issues posed are applicable in evaluating other facets of police department operations. Service level determination, workload measurement, and benefit-cost analysis should have utility in evaluating such important functions as investigations, community relations, communications and records.

EXHIBIT I
 CONCEPTUAL DESIGN OF PERFORMANCE-COST DECISION-MAKING
 SYSTEM FOR THE FIELD POLICING FUNCTION



* Cost and benefit analysis of alternative approaches and methods for providing field policing services can be conducted at various stages of the decision-making process, particularly Tasks 1 through 4, 6 and 7, and 9 through 12.

TASK 1 FORECAST THE VOLUME OF COMMUNITY
GENERATED CASELOADS WHICH WILL REQUIRE
POLICE HANDLING

(1) Purpose

The overall purpose of this initial work task in a performance-cost decision-making system is to project the community generated caseload which the police department will be required to handle during the next budget period (either a fiscal or calendar year). This work task provides the framework for:

- . Determining the forecasted volume, by type of case, of police services requested by the community before budget decisions for the next fiscal year are finalized.
- . Developing and maintaining a data base on policing caseloads caused by crime and non-crime incidents as well as monitoring historical and continuing workload trends.
- . Insuring that policing caseloads and the elements which comprise them are regularly visible to police administrators and city officials who make decisions on police service levels and resource requirements.

It should be noted that caseload forecasts, at this point, are restricted primarily to requests for services from the community. The projected workloads of field policing units which are "officer initiated," like traffic enforcement and conspicuous patrol, will be estimated in subsequent work tasks.

(2) Methodology

The methodology for forecasting community generated caseloads which will require police handling is outlined below:

(2.1) Defining the types of police caseloads

It is widely recognized today that police agencies, particularly field policing units, handle a diverse range of cases which involve incidents of both a criminal and non-criminal nature. It is important, therefore, that these various caseloads, by type of case, be defined as precisely as possible to provide the basis for caseload forecasts as well as subsequent work measurement activities.

Police caseloads which primarily are generated from service requests by the community can be divided into two general categories:

- Crime investigation which includes all incidents of a criminal nature that a police department is obligated to handle, primarily Part I and II offenses that are reported.
- Community service which includes all incidents that generally are not criminal in nature, primarily traffic accidents investigated, Part III incidents and other public service calls.

Part I and II caseload volumes, by type of case, are maintained by most police departments because of the UCR system of the Federal Bureau of Investigation. There is little need, therefore, to describe the types of cases which are included in these well-known crime classifications. However, it should be noted that violations of city ordinances, criminal warrants served, bomb scare investigations, and arrests for other jurisdictions should be added to the "criminal investigation" category in the definition of these types of cases.

However, detailed information on the type and number of incidents which might fall into the broad category of "community services", like those suggested in Exhibit II, following this page, often are not maintained or available. Often these data are lumped in a general classification like "other public service requests" which distorts their nature and relative magnitude. In the larger departments, standard radio and signal codes or the LEMERAS call classification system provide good guidelines for establishing a more detailed breakdown and tabulation of "community service" caseloads.

The definition of police caseloads and tabulation of their respective magnitudes, by type of case or incident, focuses needed attention on the issue of field policing workloads. This information, coupled with subsequent analysis, makes it possible to:

- . Determine what types of cases and how many actually are initially handled by field policing units (like patrol units, traffic officers, police agents and so on) as compared with detectives or the complaint desk.
- . Determine if some of these types of cases can be handled at least as well by less expensive personnel like community service officers, police cadets or personnel in other public or private agencies, or, perhaps, not handled at all by the police department.
- . Determine how much time these various types of cases or incidents actually require in man hours.

(2.2) Determining the historical trends in reported caseloads in terms of volume and percentage changes

Once the various types of community generated caseloads have been clearly defined in the criminal investigation and community service categories, caseload trends pertaining to the volume and percentage changes can be determined. This is done by:

- . Collecting and tabulating the caseload volume for each type of reported case or incident for the most recent six-year period.

EXHIBIT II
POSSIBLE CLASSIFICATION OF COMMUNITY SERVICE CASELOADS FOR
USE IN WORKLOAD FORECASTING AND ANALYSIS

- . Abandoned vehicles
- . Traffic accident - injury
- . Traffic accident - property damage
- . Ambulance escort
- . Animal noise disturbance
- . Animal injured
- . Animal loose
- . Assistance to stranded motorist
- . Suicide investigation
- . Speech or talk given
- . Lost property recovery
- . Lost property report
- . Property hazards (main broken, line down, tree down)
- . Traffic congestion and control (not regular assignment)
- . Response to fire alarm
- . Missing person report
- . Found missing person
- . Injured or sick person (non-traffic)
- . Insane persons handled
- . Family, neighbor, landlord-tenant, juvenile disturbance or dispute
- . Sudden death investigation
- . Funeral or parade escort
- . Mail or money escort
- . Noise disturbances/other petty annoyances
- . False alarms investigated
- . Public events monitored

- . Computing the annual numerical and percentage increase or decrease in caseloads, by type of case, for each year and then the overall change in each type of caseload (the percentage change of each year + or - added together) as well as the number of cases.

It should be noted that no attempt is made to determine the actual amount of crime which occurred in the community during the past six years. However, it is accepted today that the actual amount of major crime which occurs against persons and property probably is at least twice as high as that reported through the UCR system. It is also recognized that the amount of reported crime (which is part of the police workload) is affected significantly by such factors as:

- . Changing expectations of disadvantaged groups regarding police protection and their increased willingness to report crimes. Also, some departments encourage their citizenry to report crimes so that crime patterns can be better discerned and police deployment improved.
- . The professionalism of the police and central control executed over crime reporting systems which can either increase or decrease the informal disposition (and non-reporting) of individual cases.
- . The feeling by some citizens that thefts need to be reported to substantiate insurance claims.
- . Variations in the way different types of crimes are classified.

The ability of a police department to use caseload trend information for forecasting purposes depends on (1) the amount and accuracy of detailed caseload data available from previous years; and (2) the potential impact of changing demographic characteristics, public attitudes toward the police, geographical and climatic considerations and social and educational characteristics on future caseload levels.

Many small- and medium-sized police departments may not have data, in sufficient detail, to determine historical caseload trends (in terms of volume and percentage changes) by each type of case. When this condition exists, broad caseload categories like Part I cases, Part II cases, traffic accidents, and public service incidents can be utilized. However, a more detailed data base should then be established to obtain these data in the future for each caseload type.

It is doubtful whether many medium-sized departments will be able to make much inroad in determining and using meaningful correlations between police caseload levels, by type, and various demographic and other relevant characteristics for caseload forecasting purposes. It is recognized that many factors affect crime caseload trends but they are not easy to isolate and, with existing data inadequacies, these correlations probably are of limited value. However, other research in this area can be monitored so that qualitative judgments can be made regarding the impact of various demographic considerations when caseloads are forecasted. For example, various studies have suggested that:

- . The rate of offense per individual in the under 18 year old group is several times higher than that in older groups for burglary and larceny (nearly 50% of those arrested) and auto theft (over 60% of those arrested). Also, the 18 to 24 year old age group accounted for 26%, 39%, and 44% of all persons arrested for homicide and aggravated assault, robbery and rape, respectively.

Therefore, crime caseloads might be forecasted to increase significantly if an appreciable age composition change in a community was expected to occur.

However, these types of correlations are of little use in forecasting possible changes in non-crime caseloads. Moreover, various demographic data needed to conduct correlation analyses generally are not available except when regular or special census studies are conducted.

(2.3) Forecasting the community generated caseload for the next budget period

After historical caseload trends, by type of incident, have been ascertained, the estimated caseload for the next budget period (usually a fiscal year) can be projected for community generated service requests. As noted earlier, officer initiated workload like stopping suspicious persons, house checks, and issuing traffic citations will not be determined until Task 2, the establishment of quantitative service level objectives, has been completed.

In projecting community generated caseloads, the following steps can be taken:

- . Determine an estimated rate of change for each type of case based on the previous five-year trend data with each year given a higher rated weight (from 1 to 5). Thus, if the annualized rate of change for burglaries was 5%, (3%), 7%, 9%, and 9% from 1966 through 1971, the weighted estimated rate of change to be used for forecasting would be $5\% - (6\%) + 21\% + 36\% + 45\% \div 15 = 6.7\%$.
- . Determine the estimated caseload volume for each type of case for the current fiscal year. If the city has a fiscal year of July 1 through June 30 and actual reported burglaries were 2,800 through February (243 days, or for .6657 of the year), the estimated burglaries for the complete fiscal year could be estimated at $2,800 \div .6657 = 4,206$.
- . For each type of case in the crime investigation and community service categories, apply the weighted and annualized percentage change trend rate to the current yearly caseload volume. Using the burglary example, this would be $106.7\% \times 4,206 = 4,488$.

Adjust projected caseload volumes, by type of case, on the basis of qualitative judgments regarding factors which could increase or decrease community generated caseload levels such as:

- Changes in state laws or city ordinances involving criminal actions like legalization of gambling or enactment of litter or noise pollution ordinances.
- Assignment of various functions to or from the police department like eliminating police escort services for certain functions or having the police initiate an expanded crisis intervention program.
- Changes in law enforcement emphasis or targets like reducing attention to users of soft drugs or minor traffic accidents.
- Changes in communications systems for making service requests like the use of the 911 emergency number which has been estimated to increase calls for services at least 25%.

As indicated earlier, departments which do not maintain detailed workload data by type of case probably will need to project caseloads on the basis of four aggregate categories: Part I and II cases, community services and traffic accidents. Once this is done, the percentage distribution of cases by type for the current fiscal year (or for a sample month) can be applied to these aggregate projections to obtain estimates of caseload volumes by type of case.

(2.4) Providing further breakdown of projected caseload levels

A fourth step in projecting community generated caseloads is to provide a further breakdown of these workload volumes in terms of their tentative handling disposition, "on view" nature, and supporting workload requirements (like report writing and arrests) as follows:

- . The estimated number of cases which will be handled by the complaint desk and will not require the dispatch or use of a field unit.
- . The estimated number of cases which will be in response to a called for service and those "on view" and initiated by a police officer rather than through the dispatching process.
- . The estimated number of cases which will be handled initially by various types of field or other units, including general patrol units, police agents, selective enforcement units, traffic units, detective units, and other types of units like warrant officers.
- . The estimated number of comprehensive field reports which will need to be written and partial or "incident only reports" required by field policing units.
- . The estimated number of arrests and bookings which will result from crime related caseloads.
- . The estimated number of cases which will require two or more officers for handling or backup.

These projected data will need to be estimated based on a caseload analysis of the workload occurring during the current fiscal year through an evaluation of dispatch cards (if they contain these data) or a four to eight week sample of officer daily logs.

(3) Task responsibility

Forecasting the volume of community generated workloads which will require police handling should be the responsibility of the department's research and planning unit supported by personnel in the communications and records units.

(4) Considerations which affect decision-making in this work task

Caseload projections in many medium-sized police departments will face initial problems because of the following:

- . Limited historical and current data on the volume of different types of "community service" incidents which are requested from the police. Caseload volumes for Part I and II offenses should be readily available because of UCR requirements.
- . Establishing a reasonable accuracy factor on caseload forecasts (with actual caseloads being + or - of no more than 2% of projected levels) because of inaccurate or only limited information and difficulties in making qualitative judgments on various legal, social, economic, and service emphasis factors which can affect future caseload levels.
- . The absence of current workload data which indicates what caseload volumes are being handled by field and other organizational units (like the complaint desk) and backup requirements among field units.

These problems can be rectified gradually by establishing recordkeeping procedures and systems that provide these data for future caseload projection tasks.

TASK 2-ESTABLISH QUANTITATIVE SERVICE LEVEL OBJECTIVES AND MEASUREMENT CRITERIA

(1) Purpose

The purpose of this task is to develop and obtain agreement on service level objectives for field policing forces which are quantifiable, measurable and can be achieved during a specific time period. This objective-setting task is a key element in an improved performance-cost decision-making system since:

- . It requires police administrators, city manager, and city council to collectively and formally agree upon what they expect field policing forces to accomplish during the next year.
- . It provides key decisions on results expected which then allow the volume of officer-initiated workload in the service areas of crime repression and traffic control to be forecasted.
- . It provides broad direction and measures to continuing analytical efforts within the department regarding alternative ways of achieving these objectives and their respective benefits. It also helps to identify policing activities which may not be related to the desired results expected and, therefore, are possibly obsolete or needless.
- . It provides a foundation upon which decisions regarding manpower and equipment requirements, in particular, can be based, documented, and justified. The existence of these service level objectives focuses attention on what will be achieved with the policing resources and dollars expended.
- . It provides a numerical measure for assessing the performance of the field policing forces in relationship to formalized objectives.

It provides the framework within which other quantifiable sub-objectives can be established for organizational units involved in the field policing function which contribute to overall service level objectives.

(2) Methodology

The methodology for establishing service level objectives and measurement criteria for field policing activities is outlined below.

(2.1) Defining major service areas for field policing and their relative priorities

There is general agreement that the major service areas for field policing personnel can be defined broadly as: (1) crime investigation or apprehension; (2) community service; (3) crime repression or prevention; (4) traffic control or safety; and (5) field operations support. It is recognized that in defining these major service areas, other service categories can be considered as set forth in various studies in police goal formulation. Also, police departments may wish to define, in more detail, the various service activities which occur within each major service area to provide a framework or guide for the future development of various sub-objectives.

The definition of major service areas and service activities focuses attention on the simple question of what is the job to be done by field policing forces. However, this question is important in police departments today since:

The responsibilities and roles of field police forces are gradually changing and this trend will likely continue in the future. For example, several years ago, community relations and education were not considered high priority service activities of field policing personnel. These responsibilities were to be met by a community relations unit if one existed. However, some departments have been involving field police more heavily in various community relations activities (like the basic car plan and neighborhood officer program). This decision has real impact on the time requirements of field forces and, particularly, resulting manpower needs in meeting this service activity priority.

- . What field policing forces should be or can be held accountable for has not always been clearly defined. Therefore, it has been difficult in some instances to develop service measures which are achievable and within the work scope of field policing personnel. For example, it's not particularly realistic to hold field policing personnel accountable for crime levels in a community. However, they can be held accountable for their performance on various crime investigation or suppression service activities.

Several guidelines which can be followed in defining service areas and activities for field police include the following:

- . Describing each service responsibility and activity by a brief title which identifies a major area in which results are expected and can be measured. For example, "crime investigation" as a defined service area rather than "protecting persons and property from illegal behavior. "
- . Avoiding the combination of major service areas or activities. For example, for field policing forces "crime investigation" and "crime repression" are better defined as two distinct service areas rather than the term "crime control. "
- . Recognizing the service relationships which exist among organizational units within and external to the department. For example, "other law enforcement agency support" is an important service activity in the service area of "crime investigation. "

The last step in defining major service areas and activities is ranking them in priority order within a specific police department. The establishment of priorities for service areas and activities within these areas will provide guidance in subsequent decisions on where analytical time will be spent in assessing the benefit and cost of alternative ways of achieving objectives and where resources, particularly manpower, will be concentrated. In determining priorities among major service areas and activities, various factors will need to be considered, including:

- . Their importance to the community being served and city officials as determined by periodic community attitude surveys, discussions with city officials, citizen complaints, and periodic crime audits.
- . Their importance to police administrators and field policing personnel as determined by periodic employee questionnaires, group discussions, and the observations and opinions of supervisors.
- . Analysis of the results of research efforts in other law enforcement agencies as well as field demonstrations within the department which provide insights on the importance of various service areas and activities.

The establishment of priorities for service areas and activities is an important task not to be neglected. For example, a police chief may place high priority on traffic control and devote a large number of specialized units to this major service area. However, the city council and city manager may not assign this service area the same priority. This possible conflict in priorities requires resolution since, in the real world, the financial resources available to finance field policing functions are limited and not every service area or activity can receive all the funding desired.

(2.2) Establishing specific objectives for each field policing service area

The formulation of objectives for each service area is the second key step to take in making service level, tactical and resource decisions for field policing. In simplest terms, these policing objectives represent desired accomplishments which can be measured within a given time frame, at least during the next fiscal year. To be useful in the performance-cost decision-making system being proposed in this study, the objectives for the field policing function should be:

- . Precisely stated.
- . Measurable through the police information system available on a continuing or valid data sampling basis.

- . Realistic and capable of accomplishment within the anticipated resources available.
- . Important to the police department and directly related service areas which exist and activities to be performed.
- . Defined in such a manner as to "stretch" the capabilities of field policing forces to some practical degree.
- . Determined from the top down to provide policy direction to various field policing units in the department in formulating sub-objectives which contribute to their achievement.

To establish service level objectives for the field policing function, several approaches can be employed, including the following:

- . Reviewing other police goal formulation efforts and the various publications on PPBS by the State-Local Finances Project of the George Washington University.
- . Conducting individual and group goal discussion sessions with police personnel at various levels within the police department.
- . Examining, in detail, the operating characteristics of field policing units and programs to determine the nature and magnitude of problems which may exist for which objectives are needed.
- . Analyzing crime trends in the city and key problems which are evident.
- . Monitoring research projects in other police departments which seek to test the benefit and cost of historical or newer field policing tactics and approaches.

Exhibit III, following this page, outlines possible candidate objectives and measures for each major service area which police departments may wish to consider as they undertake this objective-setting task in determining service levels for field policing forces.

It should be noted that service level objectives and sub-objectives eventually can be arranged in a hierarchy throughout the department to show how each organizational unit will need to contribute to each major service level objective. This hierarchical arrangement provides an opportunity to: (1) focus attention on and analysis of the work handling alternatives and resource requirements for various field and other units which have impact upon agreed service levels; (2) link the performance of these units to service level decisions; and (3) measure and monitor this performance.

Exhibit IV, following Exhibit III, provides an illustrative example of how these service level objectives and sub-objectives might be formulated for the major service area of crime investigation as measured by response time.

(2.3) Monitoring the performance of field policing forces at least quarterly and annually

Once service level objectives have been established, the performance of field policing forces against these desired results should be systematically monitored and reported to the city manager and city council at least quarterly and at the end of each year. This reporting follow-through is needed to:

- . Discover if problem areas exist in providing these service levels.
- . Provide corrective actions, if possible, so that field policing performance can be strengthened and brought more in line with the service level objectives established.
- . Identify service level objectives and sub-objectives which perhaps were unrealistic, given available resources, and, therefore, require modification.

EXHIBIT III

HIERARCHY OF CANDIDATE OBJECTIVES AND MEASURES FOR
FIELD POLICING FORCES

MAJOR SERVICE AREA:	1. <u>Crime Investigation</u>	2. <u>Crime Repression</u>	3. <u>Traffic Control</u>	4. <u>Community Service</u>	5. <u>Field Operations Support</u>
Service Objective:	a. <u>Average delay and travel time from when call received to arrival of patrol unit by type of crime</u>	a. <u>Average hours or percent of available time for conspicuous patrol</u>	a. <u>Average hours or percent of available time for traffic enforcement by type of activity</u>	a. <u>Average delay and travel time from when called, received, to arrival of unit by type of activity</u>	a. <u>Average time required for providing assistance to other policing units by type of activity</u>
Sub-Objectives:	a. 1 For "incident in Progress" CFS a. 2 For important CFS a. 3 For "As Available" CFS	a. 1 Per resident or transient population a. 2 Per forecasted repressible crime a. 3 Per day or watch a. 4 Per accessible street mile a. 5 Actually "on the street"	a. 1 Per resident or transient population a. 2 Per registered vehicle a. 3 Per one direction street mile a. 4 Per traffic court per mile a. 5 Per forecasted accident by type	a. 1 For emergency non-crime CFS a. 2 For important non-crime CFS a. 3 For "As Available" non-crime CFS	a. 1 Per day or watch
Service Objective:	b. <u>Number of arrests made by field policing forces on CFS by type of crime</u>	b. <u>Number of "on view" arrests made by field patrol forces on conspicuous patrol by type of crime</u>	b. <u>Number of injury and property damage accidents</u>	b. <u>Percent of callers not satisfied with policing services by type of activity</u>	b. <u>Average on duty time required for professional development and training</u>
Sub-Objectives:	b. 1 Handled within the department b. 2 Resulting in formal complaint b. 3 Resulting in a conviction	b. 1 Handled within the department b. 2 Resulting in formal complaint b. 3 Resulting in a conviction	b. 1 Per resident or transient population b. 2 Per registered vehicle b. 3 Per one direction street mile b. 4 Per traffic count per mile	b. 1 For emergency CFS b. 2 For important CFS b. 3 For "as available" CFS	b. 1 Per day or watch

EXHIBIT III (2)

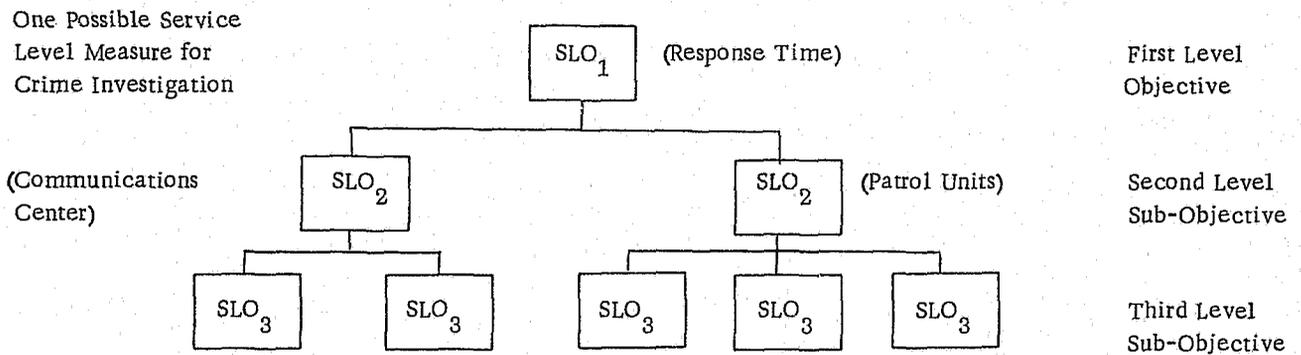
Service Objective:	c. <u>Percent of callers not satisfied with policing services by type of crime</u>	c. <u>Number of overall reported crimes by type and repressible crime by type</u>	c. <u>X Ratio of citations for serious moving violation to fatal and non-fatal personal injury accidents</u>	c. <u>Average hours or percent of available time for community services</u>	c. <u>Number or percentage of time vehicles and equipment essential to field duty are not available</u>
Sub-Objectives:	c. 1 For "Incident in progress" CFS c. 2 For important CFS c. 3 For "As available" CFS	c. 1 Per resident or transient population c. 2 Per available field man years, hours or patrol units c. 3 Per day or watch	c. 1 With conviction c. 2 Per day or watch	c. 1 Per resident or transient population c. 2 Per forecasted non-crime call c. 3 Per day or watch c. 4 Actually "on the street"	c. 1 Per day or watch
Service Objective:	d. <u>Average hours or percent of available field patrol time for crime investigation</u>	d. <u>Number of field "crime stop" contacts made</u>	d. <u>X parking, moving traffic citations or warnings</u>	d. <u>Number of service contacts made</u>	d. <u>Number or percentage of time officer initiated field communications are delayed</u>
Sub-Objectives:	d. 1 Per resident or transient population d. 2 Per forecasted crime d. 3 Per day or watch d. 4 Actually "on the street"	d. 1 Per resident or transient population d. 2 Per available field man years, hours or patrol units d. 3 Per forecasted repressible crime d. 4 By type of repression activity d. 5 Per day or watch	d. 1 Per available man year, hours, or units d. 2 Per one direction street mile d. 3 Per traffic count per mile d. 4 Per day or watch	d. 1 Per resident or transient population d. 2 Per available field man years, hours or patrol units d. 3 Per forecasted service d. 4 By type of service activity d. 5 Per day or watch	d. 1 Per day or watch d. 2 By urgency of call

EXHIBIT III (3)

Service Objective:	e. <u>Average time required for travel and disposition of a CFS by type of crime</u>	e. <u>Number of crowd control incidents</u>	e. <u>Average delay and travel time from when accident call is received to arrival of a patrol unit</u>	e. <u>Average time required for travel and disposition of a CFS by type of service</u>	e. <u>Average time required for field supervision of policing units</u>
Sub-Objectives:	e. 1 Per day or watch e. 2 Not requiring further handling within department	e. 1 Where no arrests made e. 2 Where no injuries occur	e. 1 For emergency CFS e. 2 For important CFS e. 3 For "as available" CFS	e. 1 Per day or watch	e. 1 Per day or watch
Service Objective:		f. <u>Average time required for travel and disposition by type of crime repressible activity</u>	f. <u>Average time required for travel and disposition by type of traffic control activity</u>		
Sub-Objectives:		f. 1 Per day or watch f. 2 By type of repressible crime	f. 1 Per day or watch		

Note: CFS represents called for service. These various service level objectives and sub-objectives can also be formulated for geographical areas throughout a city and for different types of field units like patrol, motor and selective enforcement teams.

EXHIBIT IV
ILLUSTRATIVE HIERARCHY OF SERVICE LEVEL
OBJECTIVES FOR CRIME INVESTIGATION



SLO₁ Reduce average response time for reported crimes in progress from eight (8) minutes to four (4) minutes

(Communications Center)

SLO₂ Reduce average dispatching delay time from four (4) to two (2) minutes

SLO₃ Provide for the number of dispatch and complaint desk personnel so that X% of all calls received are ready for dispatch in one (1) minute

SLO₃ Provide telephone tie lines to the communications center to ensure Y% of non "in progress" calls can be placed in queue when "in progress" calls received

(Patrol Units)

SLO₂ Reduce average travel time after dispatch of call from four (4) to two (2) minutes

SLO₃ Allocate patrol force to forecasted CFS so an X% probability exists that a patrol unit will be available to respond to a call

SLO₃ Design the beat structure for each patrol unit so that street miles covered by each patrol unit in service is reduced Y%

SLO₃ Provide two (2) hours of in-service training each year per officer with less than two years experience to increase their familiarity with the shortest travel routes to call locations

Add new or unanticipated service level objectives and sub-objectives which occur because of changing field policing requirements.

Also, these service level objectives will need to be reviewed and updated each year prior to the detailed budget preparation process as part of the performance-cost decision-making system proposed in this study.

(3) Task responsibility

A number of municipal personnel need to be involved in the formulation of service level objectives and measures for the field policing function. This involvement and the responsibilities of each participant are summarized below:

<u>Participant</u>	<u>Responsibility</u>
City Council	Approving or modifying, where necessary, major service level objectives for the field policing function and their relative priorities; providing the financial resources required to achieve approved objectives; reviewing progress of the department annually in achieving these service objectives.
City Manager	Recommending major service level objectives, priorities, and resource requirements to the city council and their rationale; and reviewing progress in achieving those objectives at least quarterly.
Police Chief	Proposing and justifying major service level objectives (which are quantified), priorities and resource requirements to the city manager; providing alternative objectives and resource requirements under different funding level assumptions and the advantages and disadvantages of each alternative; presenting approved service level objectives

Participant	Responsibility
Other Unit Commanders and Supervisors	to all relevant organizational units; reporting progress in achieving these major service level objectives at least quarterly to the city manager problems which exist and corrective actions being taken; and reviewing, modifying and approving sub-objectives of each organizational unit which contribute to achieving major service level objectives which have been approved.
Planning and Research Unit	Developing sub-objectives for meeting major service level objectives, priorities, resource needs and their justification for approval by the Police Chief; continually testing and evaluating alternative ways of accomplishing sub-objectives with the least amount of resources and presenting these alternatives, including their benefit and cost, to the Chief; and reporting progress in meeting sub-objectives to the Chief monthly, problems, and corrective actions being taken. Providing analytical support to the Chief, unit commanders and supervisors in quantifying objectives and sub-objectives; assigning priorities; identifying alternatives; and determining the benefit and cost of each alternative.

In the objective-setting process as it pertains to field policing service levels, city council discussion and approval of major service objectives and the necessary resource requirements are of critical importance.

(4) Considerations which affect decision-making in this objective-setting work task

The process of establishing service level objectives which are quantifiable, measurable, achievable and meaningful will be affected by a variety of considerations and issues, as summarized below:

(4.1) Possible informational gaps within the police department

Some existing police information systems are highly sophisticated and others are rudimentary. Depending upon the service level objectives and sub-objectives selected for the field policing function, steps will need to be taken to obtain regularly or at least on a valid random sample basis, important data required to measure the achievement of various policing objectives and sub-objectives, particularly the following:

- . The average response time (for processing delay in the communications center, travel time of patrol units after dispatch until arrival, and total time) by type of crime and non-crime service; and classified further by the seriousness of the call, including "incident in progress", important, and handle as available.
- . The number of arrests and percentage of total departmental arrests made by field policing units by type of crime in response to a called for service as well as an officer initiated action stemming from crime repression activities; and categorized further by the disposition method for the arrest, including handling within the department, issuance of a formal complaint; and resulting in a conviction.
- . Average hours or percent of available and "street" time which is not devoted to calls for service, report writing, arrests, and other service activities per forecasted repressible crime by type and per accessible street mile; and number of "crime stop" contacts made per forecasted repressible crime by type of repression activity.

- . Average time required and desired for travel and disposition of a called for service by type of call; report writing; arrests and bookings; various traffic control tasks; various community service tasks; and various crime repression tasks.
- . Number and percent of callers not satisfied with field policing services by type of service; and classified further by the seriousness of the call, including "incident in progress", important, and handle as available.
- . Number of overall reported crimes (unfounded and founded) by type and repressible crimes by type; classified further per resident and transient population, geographical area, day of week and time of day.
- . Ratio of the number of moving traffic citations with conviction to the number of fatal and non-fatal personal injury accidents; and average hours or percent of available and "street" time for traffic enforcement by type of activity.
- . Average on-duty time required and desired for providing assistance to other policing units, training, and field supervision by type of activity.

These data, where possible, also should be collected on a geographical basis and by type of field policing unit, such as patrol, motor, special enforcement, and helicopter units.

It should be noted that several approaches should be considered in measuring the number and percent of callers not satisfied for field policing services and their reasons, including:

- . Conducting periodic service audits of a number of randomly selected calls somewhat similar to the "crime audit" program conducted by the Governmental Research Institute for the St. Louis Police Department. Under this program, a two-man team composed of a member of the department and another city agency would interview a selected number of callers on crime and non-crime matters to determine the completeness, accuracy and usefulness of officer reports; and their opinion of the adequacy of the police services provided.

- . Developing, disbursing and analyzing concise citizen attitude questionnaires (perhaps distributed through the utility billing system) to determine their evaluation of the field police services they receive. This survey should include both the users (persons calling for service) and non-users (persons who normally have little contact with the police) and be representative of residents in various social, economic, age and geographical groups.

(4.2) Knowledge gaps within the police service field

Various knowledge gaps, in varying degrees, currently exist which impede decision-making regarding the validity and priority of possible service level objectives and sub-objectives for the field policing function. These knowledge or "state of the art" gaps include the following:

- . What numbers or percent of crime level increases by type of crime come from former non- and under-reporting by citizens or internal police reporting procedures as opposed to net crime level increases?
- . What is the optimum response time (within the control of the police department) in cities of various size by type of call to maximize the probability of arrest or eventual apprehension of a suspect as well as minimize the effects of an important non-crime problem?
- . What is the true impact of arrests by field policing forces by type of crime on reducing or limiting the increase of crime levels by type? How is the quality or ultimate crime effect of an arrest by field policing forces maximized?
- . What crimes indeed are repressible by type and to what degree by field policing actions through conspicuous or non-conspicuous patrol or other repression tactics?
- . What is the standard time which should be spent on various field police service activities like called for services by type, report writing, arrests, other service activities, training and backup to other officers?
- . How do you accurately measure the needs and desires of residents for police services by type of service?

- . What is the optimum level of traffic regulation enforcement by type of activity to minimize traffic accidents by type?

Research and field demonstrations regarding these questions as well as others will need to be continually analyzed to provide improved guidelines for decision-making in these areas. Unfortunately, to date, the results of previous and current research efforts in various police departments which have relevancy are either: (1) not commonly known; (2) not readily available; or (3) not regularly reviewed to determine their applicability if known and available. Also, many medium-sized police departments do not have adequate analytical support to develop valid research designs and evaluate these or related questions or sufficient field personnel to pilot test, in actual field situations, approaches for resolving these issues.

TASK 3 FORECAST THE VOLUME OF OFFICER INITIATED WORKLOADS THAT WILL BE HANDLED

(1) Purpose

The purpose of this third work task is to project the policing workloads which will be generated through the initiative of field policing units in exercising primarily their crime repression and traffic control responsibilities. These workload volume forecasts are based upon the service level objectives established in Task 2 with further refinements as additional thought is given to the types and emphasis of these policing activities.

This work task, like Task 1 when community generated caseloads were projected, is directed toward: (1) determining the estimated volume, by type of officer-initiated activity, before finalizing police budget decisions; and (2) establishing an information base for more clearly identifying and monitoring the crime repression and traffic control workloads of field policing units.

(2) Methodology

The methodology for projecting officer initiated workloads in the areas of crime prevention and traffic control is summarized below.

(2.1) Defining the types of officer initiated workloads

Work activities which basically are initiated by policing units in the field generally fall into two categories:

- . Crime repression which includes all activities that field policing units engage in to minimize, deter or eliminate various criminal acts and to keep the peace before enforcement actions are required.
- . Traffic control which includes the activities required to minimize or deter traffic accidents which result in personal injury or property damage and to regulate traffic flows and parking on streets.

Crime repression remains one of the most widely discussed and least understood service responsibilities of municipal police departments and the proper role of field units in crime repression has not been clearly defined. Various studies and police officials indicate that from one-third to one-half of a field officer's time should be available for patrol to: (1) deter persons from criminal acts by maintaining a constant awareness in the community that the police are available and can rapidly enforce the law; (2) observing criminal acts in progress and apprehending law violators; and (3) investigating suspicious circumstances and removing crime hazards. However, the value of "preventive patrol" in the traditional sense is being questioned increasingly since:

- . One study indicated a patrol officer in Los Angeles can expect an opportunity to detect a burglary no more than once every three months and a robbery once every 14 years.
- . Many crimes (like assaults, homicides and liquor law violations) either are not "observable street crimes" or occur among persons who know each other and, therefore, not highly repressible through motorized units cruising an area.
- . Various alternative crime detection tactics like using unmarked cars, installing better street lighting, employing bicycle patrols and utilizing television monitoring as well as other surveillance devices have been experimented with.

It is evident that the definition of desired and relevant crime repression activities for field units will not be easy since the roles, responsibilities and impact of field police in crime repression are unclear or in a state of change. However, to provide guidance in this analytical effort, Exhibit V, following this page, sets forth a listing of possible crime repression activities of field policing forces which may be used for forecasting these desired workload volumes.

Traffic control activities generally are more easily defined than those involving crime repression. Possible activities on which workload forecasts could be based include:

- . Warnings given by type of violation
- . Parking citations given
- . Traffic citations given for hazardous violations
- . Traffic accidents investigated involving personal injury
- . Traffic accidents investigated involving property damage only
- . Traffic safety talks given
- . Individual or group counselling and referral for repetitious violators
- . Motorized surveillance per mile and frequency
- . Stranded motorists aided
- . Potential traffic accident hazards identified and removed
- . Fixed post traffic direction tasks completed
- . Committee attendance and service (in groups involved in traffic safety)
- . Traffic control escorts provided

EXHIBIT V

POSSIBLE DEFINITION OF CRIME REPRESSION ACTIVITIES
FOR USE IN WORKLOAD FORECASTING AND ANALYSIS

1. STIMULATING CITIZEN AWARENESS OF AND PARTICIPATION IN CRIME SUPPRESSION

- . Crime prevention talks (at schools/neighborhood councils/clubs in patrol sector)
- . Crime prevention brochures distributed (in patrol sector)
- . Voluntary house/business inspections (to help burglary control in patrol sector)
- . Committee attendance and service (in groups working on poverty, housing, discrimination and social problems)

2. DIRECT PROBLEM-SOLVING AND SOCIAL SERVICE COORDINATION

- . Individual or group counselling (for persons with behavioral/medical problems promoting delinquency or criminal tendencies)
- . Social services initiated and coordinated to solve individual problems

3. KEEPING THE PEACE AND MAINTAINING ORDER

- . Family crisis incidents handled without law enforcement (in patrol sector)
- . Participation in problem-solving opportunities involving group unrest (like rap sessions or minority officer recruitment)
- . Crowd control incidents handled without law enforcement

4. FOSTERING FEELING OF COMMUNITY SECURITY AND CRIME DETECTION SURVEILLANCE

- . Motorized surveillance per mile and frequency (for residential/highrise/commercial/industrial/park/ public facilities areas)
- . Foot surveillance per block and frequency (for different types of land use areas)
- . Aerial surveillance per square mile and frequency (for different types of land use areas)
- . Suspicious persons or vehicles stopped and interrogated or investigated
- . Stake-outs conducted
- . "On view" crimes detected or arrests made
- . Potential crime hazards removed (through house and business checks and then locking doors or windows or notifying owners of corrective actions needed)
- . Crime repression information requested or given

It should be noted that the effectiveness and relevance of various traditional traffic control activities also are being questioned today. For example:

For years, many communities have tried to maintain a traffic enforcement index or ratio of at least 20. This represents 20 citations for serious moving violations with court penalty to each fatal / non-fatal personal injury accident. An increase in this ratio was considered related to a reduction in injury accidents. However, recently some cities have indicated that traffic accidents involving injuries have been decreasing even though the traffic enforcement index also has fallen. This is attributed to various factors including: traffic congestion and slower speeds, motorist use of various safety devices, and improved selective traffic enforcement.

In 1968-1969, a field test was conducted in the City of Los Angeles of different traffic enforcement techniques and motorcycle officer staffing levels. It was found that the beat where staffing remained unchanged and primarily only warnings were given showed the second largest decrease in injury accidents over the preceding four-year average. This finding provides a new dimension on the potential effectiveness of different traffic enforcement tactics.

(2.2) Determining the historical trends in reported field workloads for crime repression and traffic control

After the types of officer initiated workloads have been clearly defined, workload trends in terms of activity volumes and percentage changes can be established by:

Collecting workload volumes for each type of crime repression and traffic control activity eventually for the most recent six-year period.

Computing the annual numerical and percentage increase or decrease in each type of workload activity.

It should be noted that historical data for most types of traffic control activities should be readily available through existing record-keeping systems. However, it is doubtful that much historical and trend information on crime repression workloads by field policing units will exist except, perhaps, for miles patrolled, facilities checked, persons interrogated or percentage of time available for patrol. Therefore, new data collection procedures will require installation. For smaller departments, data on crime repression workloads might be collected and expedited by using a two-month sample each year of this workload information.

(2.3) Projecting the officer initiated workload for the next budget period

The establishment of service level objectives for crime repression and traffic control functions, coupled with historical workload trends, provides the foundation for forecasting these officer initiated activities for the next budget period. Various approaches and techniques can be used to make these forecasts in as much detail as desired. It should be noted that, given the knowledge and understanding today of field policing services, no "one best way" exists for making these projections. Therefore, experimentation and analysis will need to take place. However, Exhibits VI and VII, following this page, outline some alternative methodologies for forecasting selected officer initiated workload volumes in the area of crime repression and traffic control, respectively, based on service level objectives established in the previous work task.

The projection of officer initiated workload volumes will need to carefully consider such factors as:

The desired role of field policing units in crime repression, particularly those activities which stimulate citizen awareness and participate in crime prevention and social service coordination.

The results of various experiments taking place which seek to determine the benefit of more traditional field policing activities which are officer initiated. The study taking place in Kansas City, Missouri on the value of conspicuous patrol may shed new light on this question.

EXHIBIT VI

ALTERNATIVE METHODOLOGIES FOR PROJECTING
FIELD POLICING WORKLOAD VOLUMES IN THE CRIME
REPRESSION SERVICE AREA

Service Objective	<u>Provide for 40% of Available Field Policing Time for Conspicuous Patrol</u>
Approach	A three-step methodology can be used to forecast workloads of field units to meet this service objective: (1) community caseload volumes X average case handling time (including time for reports and arrests) = man hours needed for community generated work; (2) add the estimated time requirements for traffic control to the previous man hour total plus other time contingency factors; and (3) divide the man hour needs determined in steps (1) and (2) by .60 = gross man hours required to provide 40% of field policing time for conspicuous patrol.
Service Objective	<u>Provide Motorized Surveillance of City Streets in Residential Areas Three Times a Day and of Commercial Areas Twice a Day</u>
Approach	A three-step approach could be used for computing the workload requirement to achieve this service level: (1) street and alley miles in residential areas divided by average cruising speed (like 18 mph) X three passes per day X 365 days = yearly man hours required for vehicle surveillance; (2) street, parking lot and private driveway miles divided by average cruising speed (like 22 mph) X two passes per day X 365 days = commercial surveillance man hours needed annually; and (3) add (1) and (2) for total surveillance man hours each year. This forecasting methodology can be refined to take into account different surveillance techniques (like foot or bicycle patrol which is slower or helicopter patrol which is faster) and different land uses (like high rises, parks, public buildings and industrial parks) which may require other coverage frequencies.
Service Objective	<u>Conduct X Crime Prevention Talks, Distribute Y Crime Stop Brochures and Inspect Z Facilities Through Field Policing Units</u>
Approach	The forecasting methodology for determining this workload volume consists of: (1) estimating the number of neighborhood and civic groups which field police will talk to, subject matter and the frequency; (2) estimating the number of stops field units will make to deliver "crime stop" brochures (like on such subjects as burglary reduction in patrol sectors with burglary problems); and (3) estimating the number of voluntary home and business inspections which will be made to counsel on ways to reduce crime opportunities (like inspecting 15% of these units per year). While these activities normally have not been considered field policing work tasks, they might be programmed as such in the future.

EXHIBIT VI (2)

Service Objective Make X "On View" Arrests for Specific Types of Crimes

Approach To forecast this workload activity, the "on view" arrest pattern by types of crime (arrests made through the initiative of field officers as opposed to responding to a call for service) will need to be analyzed from prior years. If it is found that Y% of all arrests have stemmed from on view actions and enforcement emphasis will not change, then this % can be applied to the total arrest volume forecasted for the next budget period.

Service Objective Handle X Counselling Incidents and Make Y Social Service Referrals

Approach In forecasting this workload volume, historical trends as well as changes in police officer roles will require analysis. It may be necessary to sample officer activity logs and randomly interview officers to determine how many times they become involved in counselling incidents and social service referrals which are not part of case handling statistics and workloads.

Service Objective Stop Y Suspicious Persons and Vehicles

Approach The forecasting approach for this activity could consist of: (1) extending historical "suspicious circumstances stop" data factored by expected population or crime rate changes; or (2) determining that one stop will be made for each half hour of conspicuous patrol time as established in the service objective involving motorized surveillance.

Service Objective Handle Z Crowd Control Incidents

Approach The forecasting methodology for this activity would need to rely on analysis of historical data of crowd control incidents which occurred each year by size of crowd and whether injuries occurred or arrests were made. Projections will need to be factored by judgments on possible changes in community tensions which could create future crowd control incidents like gang fights or problems at the schools.

EXHIBIT VII

ALTERNATIVE METHODOLOGIES FOR PROJECTING FIELD
POLICING WORKLOAD VOLUMES IN THE TRAFFIC CONTROL SERVICE AREA

Service Objective Provide for 15% of Available Field Policing Time for Traffic Law Enforcement

Approach The methodology for forecasting workloads to meet this service objective consists of: (1) multiplying caseload volumes by average handling time requirements per case to determine man hours needed for community generated work; (2) determining the % of time desired for conspicuous patrol; and (3) dividing the man hour needs determined in step (1) by .45 (if patrol time is desired at 40% and traffic control at 15% = 55%) to determine gross man hours required to provide for caseload handling, 40% patrol and 15% for traffic enforcement.

Service Objective Issue X Parking Citations

Approach The approach for computing this workload requirement could consist of: (1) determining (by field observations on a sampling basis) the average number of meter violations which occur per meter per day during the time on or off street parking is metered and multiplying this number by the number of meters and then days each year meters are monitored; (2) determining the estimated number of citations issued for other parking violations (like prohibitions of on-street parking during certain time periods) using historical data and trends; and (3) adding the totals for (1) and (2).

Service Objective Provide Motorized Surveillance of High Traffic Volume Streets Where Accidents Occur 20 Times Per Day

Approach The methodology for calculating this workload requirement could consist of determining the miles of street with over X traffic volumes per hour divided by average surveillance speed (like 25 mph) X 20 passes per day X 260 days (excluding weekends). This forecasting methodology would require detailed analysis of actual street miles where traffic is heavy and injury accidents are high and during what time periods.

Service Objective Make 40 Traffic Stops Per Forecasted Injury Accident and 15 for Property Damage Accidents

Approach To forecast this workload activity, the following steps could be taken: (1) projecting the number of injury and property damage only accidents based on historical trend information or analysis of correlations between accidents and expected traffic volumes; and (2) multiplying these two separate accident projections by the number of desired traffic stops which will be made; and (3) determining, based on past experience and analysis, how many stops will involve the issuance of a citation and how many a verbal warning. The number of traffic stops desired can be based on analysis of historical relationships and correlations between accident levels and traffic stop contacts (to see if the number of stops affects accidents and to what degree) as well as analysis of traffic accident levels which will be tolerated.

EXHIBIT VII (2)

Service
Objective

Conduct X Traffic Safety Talks and Identify Y Traffic Accident Hazards

Approach

The approach for determining this workload volume consists of: (1) estimating the number of schools and civic groups which field police will contact and the frequency; and (2) estimating the number of hazards inspected and analyzed (like absence of stop signs or obscured traffic signs) based on inspection data.

Changes which are taking place in crime detection or deterrent technologies which may either supplement or replace field police manpower in certain of these activities.

Changes in departmental policies regarding the types of crimes toward which enforcement emphasis and crime repression will be directed.

(3) Task responsibility

Projections of the volume of officer initiated workloads should be the responsibility of the research and planning unit within the service level objectives established by city officials and policy guidelines formulated by the Chief of Police regarding law enforcement emphasis. The communications and record units also will need to participate in this analytical effort.

(4) Considerations which affect decision-making in this work task

Forecasts of officer initiated workloads in many medium-sized police departments may face several problems, including the following:

Inadequate historical data on the volume of field policing workloads related to crime repression. The use of officer activity logs, at least on a sample basis, and use of incident cards (with more comprehensive information) through the dispatch center will be required to build these data bases.

Extreme difficulty in identifying and monitoring relevant research efforts in other police agencies which seek to test the value of various field policing activities. This problem can be partially solved by: (1) obtaining summary descriptions of grants issued each year by state criminal justice planning agencies; (2) obtaining the bibliography and selected reprints of studies issued by the U.S. Department of Justice, Office of Law Enforcement Assistance and the National Technical Information Service of the U. S. Department of Commerce; and (3) keeping in touch with the research and planning units engaging in progressive experimentation in other police departments.

TASK 4 - MEASURE AVERAGE TIME REQUIRED
FOR EACH WORKLOAD ACTIVITY

(1) Purpose

The purpose of this task is to determine the average time required by field policing units in performing various types of work activities. Work measurement, which involves the quantification of man hours needed to handle various work tasks, has a number of uses in the proposed performance-cost decision-making system, including:

- . It provides the time data needed to convert projected workload volumes into aggregate man hour requirements.
- . It provides a vehicle for analyzing various methods used to perform police work tasks to insure the best and most simple work handling techniques are employed (by eliminating wasted effort and motion).
- . It provides an approach for ultimately establishing more precise and refined standards which indicate how long various work tasks should take.
- . After work output standards are developed, it provides a means for monitoring the general productivity of field policing units and identifying areas where low manpower utilization is taking place.
- . It provides essential data needed in day-to-day operations planning and scheduling for deploying field manpower in accordance to forecasted workloads.
- . It focuses attention on the existing "roles" of police officers in the field and provides data for assessing the workload impact of future changes in these roles.

It should be noted that work measurement generally has not been widely used in police departments, particularly with regard to sworn personnel engaged in field policing tasks.

(2) Methodology

The methodology for measuring the time required for field policing work tasks is outlined below.

(2.1) Defining relevant work units for the field policing function

Policing work units represent activities which police officers perform in exercising their service responsibilities in the major service areas of: (1) crime investigation; (2) community service; (3) crime repression; (4) traffic control; and (5) field operations support. In defining these work activities for which time requirements will be measured, several guidelines should be followed:

- . Police work activities should be relevant to the proposed functions or roles of field policing units. For example, "house checks" are meaningful work units of field police as they engage in crime suppression.
- . Work activities should not be defined so that they are overly complex. For example, "Part I cases handled" is a simple and understandable work indice.
- . Police work activities should be geared to data which can be made readily available. They should not require massive and costly data systems. For example, "suspicious persons stopped" is a work unit which can be easily collected. However, "suspicious persons stopped with prior criminal records" is a work activity that probably is too costly to maintain on a regular basis.

Exhibit VIII, following this page, provides a possible definition of police work units which could be used to measure field workloads. This listing is tentative in nature and will require refinement particularly in delineating the types of crime repression work activities desired by field policing forces.

(2.2) Developing an on-going work measurement capability

Work measurement within medium-sized police departments, to be effective, should be structured along the following lines:

- . At least one person (sworn or civilian) should be trained or experienced in the theory, principles and practices of methods analysis, work simplification, work measurement, reporting and control and program maintenance. This individual also should be assigned responsibility for coordinating all work measurement activities within the department.
- . Various officers should be detached temporarily to be trained and participate in work measurement programs under supervision of the program coordinator. Formal classroom training of about 80 hours usually is sufficient to initially orient a work measurement analyst.
- . Orientation sessions should be conducted for at least sergeants and captains to familiarize them in work measurement approaches and how these data can assist them in manpower deployment, scheduling and control.

(2.3) Measuring time requirements for field policing work units

In determining the time requirements of various field policing work units the recommended approach to be employed is summarized below:

- . Recording start and end times for various field policing tasks on dispatch or incident cards through voice communications and time stamping between field units and dispatchers.

EXHIBIT VIII

DEFINITIONS OF POSSIBLE WORK UNITS FOR FIELD POLICING FORCES
FOR USE IN DETERMINING TIME REQUIREMENTS

1. CRIME INVESTIGATION

- . Criminal cases handled by type (travel and handling)
- . Complete case reports written
- . Summary case reports documented (IRO'S)
- . Arrests made and bookings by case type
- . Arrests or citations by case type (no bookings)
- . Trips for prisoner transportation
- . Warrants or summons served
- . Follow-up investigations made by case type (following initial response to a called for service)
- . Court appearances made

2. COMMUNITY SERVICE

- . Incidents handled by type (travel and handling)
- . Complete incident reports written
- . Summary incident reports documented (IRO'S)
- . Follow-up handling by incident type (after initial response to called for service)

3. CRIME REPRESSION

- . Street miles conspicuously patrolled
- . Suspicious persons/vehicles checked
- . Houses/businesses and other hazards checked
- . Street "crime stop" contacts made by type
- . Scheduled crime prevention speeches/talks given
- . "On view" criminal cases detected by type
- . Complete case or incident reports written
- . "On view" arrests and bookings by case type
- . "On View" arrests or citations by case type (no booking)
- . Stake outs by case type
- . Court appearances made because of "on view" actions

4. TRAFFIC CONTROL

- . Warnings given/stops made (no citation)
- . Parking citations issued
- . Non-hazardous citations issued
- . Hazardous citations issued
- . Traffic accidents investigated by type (personal injury or property damage only)
- . Traffic direction incidents (scheduled or emergencies)
- . Traffic safety talks given
- . Street miles conspicuously patrolled
- . Complete accident reports written
- . Summary accident reports documented
- . Arrests made and bookings by type of incident
- . Court appearances made

5. FIELD OPERATIONS SUPPORT

- . Backup to another officer by type of case or incident
- . "On the job" training and professional development
- . Field supervision requirements.

- . Using work sampling (which is based upon the laws of probability and employs random observations) to determine time requirements and work pace for various types of work performed, particularly long cycle tasks which are not constantly repetitive. Work sampling also can be used to provide audits of the validity of time data collected through time records generated through the dispatching center.

Other work measurement techniques can be employed to determine the time needed to perform field policing tasks, including:

- . Using activity logs or time ladders maintained by field policing officers. This technique is useful in measuring a wide variety of long cycle work tasks which are not highly repetitive. However, for these times to have validity, they need to be audited periodically.
- . Having sergeants (supervisors) and police officers periodically estimate the time requirements for various work tasks, particularly those not easily measured by other techniques.
- . Using stop watch time studies to measure tasks not completely within the control of an officer (like various public contact activities) as well as provide a cross check on work output times established by other techniques.

It should be noted that whatever work measurement approaches are used, steps need to be taken (through work sampling and stop watch studies) to validate the time requirements (expressed in man hours or fractions) of various field policing work units.

Based on the time data collected in the Pasadena case study, generalized time requirements for various field policing work tasks are set forth in Exhibit IX, following this page.

EXHIBIT IX
GENERALIZED TIME REQUIREMENTS FOR
SELECTED FIELD POLICING WORK UNITS

UNIT OF MEASURE	<u>Minutes</u>	<u>Man Hours</u>	<u>Units Per Hour</u>
1. CASES HANDLED			
. Responding to Called For Services			
- Part I Offenses	37	.62	1.61
- Part II Offenses	30	.50	2.00
- Part III incidents	31	.52	1.92
- Average all incidents	32	.53	1.87
. Handling Officer Initiated Actions			
- Part I offenses	28	.47	2.13
- Part II offenses	19	.32	3.12
- Part III offenses	17	.28	3.57
- Average all incidents	22	.37	2.70
2. REPORTS WRITTEN			
. Complete case reports	20	.33	3.00
. Traffic Accident Reports	45	.75	1.33
. "Incident Only" Reports	(Part of case handling time)		
. Summary case reports (primarily minor traffic accidents)	10	.17	5.88
3. ARRESTS			
. Arrest and booking	60	1.00	1.00
. Citation and no booking	25	.42	2.38
4. TRAFFIC ENFORCEMENT			
. Warning stops	5	.08	12.50
. Parking citations	3	.05	20.00
. Non-hazardous citations	10	.17	5.88
. Hazardous citations	15	.25	4.00
. Street mile patrolled (20 mph)	3	.05	20.00
. Safety talks given	20	.33	3.00
. Fixed post traffic direction assignments	30	.50	2.00

EXHIBIT IX (2)

	<u>Minutes</u>	<u>Man Hours</u>	<u>Units Per Hour</u>
5. CRIME REPRESSION ACTIVITIES			
. Street mile patrolled (15 mph)	4	.07	14.28
. Suspicious persons/vehicles stopped	7	.12	8.33
. Houses/businesses checked	3	.05	20.00
. Street "crime stop" contacts made	5	.08	12.50
. Scheduled crime prevention talks given	20	.33	3.00
. Stake outs			(No estimates available)
6. FIELD OPERATIONS SUPPORT			
. Backup to another officer			(Same as individual case handling requirements except for report writing)
. Field supervision			(One supervisor for every six to nine units in field depending on experience of field officers)
7. OTHER UNITS			
. Follow-up investigations after initial case disposition			(No estimates available. - depends on departmental policy)
. Trips for prisoner transportation			(No estimates available)

It should be noted that this time information represents data collected by various work measurement techniques, including analysis of dispatch cards, supervisor estimates, and work sampling using a wrist watch.

Using the Pasadena case study information, calculations also were made to determine the average time requirements by case for field units, as summarized below:

.	Average cases (called for services) handled per year per patrolman . 748 cases x . 53 man hours	396. 44
.	Average cases (on-view) per year handled per patrolman . 47 cases x . 37 man hours	17. 39
.	Average reports written per year per patrolman . 387 reports x . 33 man hours	127. 71
.	Average field arrests made per year per patrolman . 36 arrests x 1. 00 man hours	36. 00
		577. 54
.	Average time per case . 577. 54 man hours ÷ 795 cases	. 726 man hours

This average time per case of . 726 man hours for travel, preliminary investigation, report writing and arrest is similar to the case time of . 75 man hours used by the IACP in man-power distribution studies.

(2. 4) Developing work output standards

After average time requirements for field policing work units have been calculated, steps should be taken to eventually establish a set of desired time standards for the performance of field policing tasks. These time standards should represent a specified amount of time to perform a given amount of work using a specific method under specified conditions by officers possessing the required skills. To do this, various field policing work tasks will need to be subjected to methods analysis to determine the most "efficient" procedures and sequence for performing work using such analytical techniques as work flow charting, equipment evaluation, and work sampling. Once this is done, the work measurement techniques described in the previous work task can be employed to determine how long the work task should take.

Work output standards development with a variety of public and private organizations has produced a number of generalized findings which apply to police departments as well as other public service organizations, including:

- . Most employees prefer to do a good day's work. However, because of poor planning and scheduling of work or caseloads (which stems from inadequate supervision) and inefficient work methods, a 20% improvement factor in productivity is possible.
- . Most police departments do not keep track of realistic workload outputs or do not have standards on what these outputs should be.
- . The productivity of police officers can be measured and work output standards developed.

Most police departments do not have a formalized and on-going methods improvement program... which is the first step in developing time standards for field policing work units. This type of program consists of a systematic analysis of all factors affecting work to save time, effort and money. The basic philosophy of methods improvement is:

- . There is always a better way to do a police work task and the "one best way" is never truly achieved.
- . Methods improvement can be applied to any work if there is a desire to save time or effort.
- . A systematic and orderly analytical approach to field policing work problems will yield better results than a haphazard approach.

Surveys in a number of police departments indicate a number of operations improvements normally exist which can be documented through an on-going methods improvement program, including:

- . Using standardized work methods for various field policing tasks (like house inspections or vehicle checks) rather than having each sergeant impose his own method or having police officers devise their own method.

- . Eliminating an excessive number of police units responding to a call (like a silent alarm) or handling a specified case (like an auto burglary).
- . Providing each field unit with the equipment necessary to achieve high or effective manpower utilization like walkie-talkies for foot investigations.

The identification of methods improvements and establishment of time standards for each field policing work task should be documented in a format similar to that set forth in Exhibit X, following this page.

(3) Task responsibility

Measuring the time required for each workload activity performed by field policing units should be the responsibility of the research and planning unit in the department supported by personnel in the communications and records units. In addition, uniform personnel trained in basic work measurement techniques should be employed in time studies to increase their acceptability and validity with departmental operations personnel. The involvement of each organizational unit is summarized below:

<u>Participant</u>	<u>Responsibility</u>
Planning and Research Unit	Defining relevant work units for field police; formulating and directing a work measurement program; training police personnel in work measurement techniques and orienting command personnel in the program; establishing record systems for collecting workload statistics; developing work output standards; developing a control reporting system for monitoring manpower utilization in relation to time standards; and conducting audits to insure the validity of standards

EXHIBIT X

ILLUSTRATIVE FORMAT FOR DISPLAYING
FIELD POLICING WORK STANDARDS

<u>OPERATION</u>	<u>STANDARD HOURS PER UNITS</u>
Random Patrol of Residential Area with Single Family Dwellings	0.07

OPERATIONS DESCRIPTION

One man patrol unit receives random patrol plan from team sergeant at beginning of shift. Patrol plan sets forth residential sectors to be patrolled and approximate timing for each sweep. Each street will be swept at 15 miles per hour so visual observation of both sides is possible. At the end of each fourth mile swept, patrol vehicle will stop and officer will check cars parked on that block on foot for keys in ignition, unlocked doors and steering columns. Notice will be left on windshield of autos found susceptible to easy car theft or car burglary. Unlocked doors will be locked if no keys in ignition.

OPERATIONS REQUIREMENTS

<u>MEN</u>	<u>EQUIPMENT</u>	<u>SUPPLIES</u>
1 Policeman	1 Marked Patrol Car 1 Walkie-Talkie	60-Brochures on Auto Theft

OPERATIONS TIME DATA

<u>Unit of Measure</u>	<u>Standard Hours</u>	<u>Man hours</u>	<u>Units Per Hour</u>	<u>Planning Units Per shift</u>
Residential street mile swept	0.10	0.10	10.00	15.00

<u>Participant</u>	<u>Responsibility</u>
Communications and Records Units	Collecting, tabulating and maintaining work unit times on dispatch or incident cards and other data collection instruments
Personnel from Operating Units	Participation in work measurement teams and maintenance of data collection instruments like officer activity logs
Police Chief and City Manager	Collective approval of work output standards for field policing forces

(4) Considerations which affect decision-making in work measurement

The process of measuring field policing workloads and ultimately establishing time standards for various work outputs will be affected by several issues and considerations, including the following:

- The changing roles and responsibilities of field policing officers. The type of work to be performed by field police (and work units to be defined and measured) will vary among departments depending on their ascribed roles and responsibilities. Work measurement, therefore, will require departments to more clearly define these responsibilities so that the following questions are answered:
 - What new or different roles will field units play in crime prevention other than the more traditional conspicuous patrol?
 - How involved will field police become in the disposition and solution of such chronic social problems as family disputes, drunkenness and various public manifestations of mental illness?
 - Will field police assume responsibilities and to what extent in such areas as group unrest, consumer protection, and pollution control?

- In what ways will field police become involved in mobilizing the community to participate in crime prevention and reduction?
 - How will the protection of individual liberties impact upon the responsibilities and workloads of field police?
 - To what degree will field police be generalists or specialists and what latitudes will they be given in decision-making in such areas as arrests or follow-up investigations?
- . The possible skepticism of police personnel regarding the measurability of field policing work tasks. This potential problem can be overcome only through orientation sessions and pointing out that the work of other professionals (like nurses, engineers and loan officers) have been effectively measured.
 - . The possible lack of a continuing work control reporting system which provides regular management information to command personnel at various levels on the work units being completed by type, how long they are taking, how actual work performed compares with standard man hours per unit, field manpower utilization expressed as a percentage of total standard time, and explanations of low productivity levels.

TASKS 5 & 6 - DETERMINE THE NUMBER OF FIELD
MAN HOURS REQUIRED FOR PROJECTED WORKLOADS AND
TYPE OF FIELD UNIT HANDLING VARIOUS ACTIVITIES

(1) Purpose

The purposes of these two work tasks are: (1) to convert forecasted workload volumes for community generated caseloads and officer initiated activities into man hour requirements (Task 5); and (2) allocate these man hours among various types of field policing units and personnel classifications (Task 6). These two work tasks focus analytical attention on:

- The initial number of policing man hours desired in the field to handle projected workloads, by type of activity, so that service level objectives can be achieved.
- The types of field policing units (like patrol, traffic, and parking control units) as well as personnel classifications (like police officers, police agents, and community service aides) needed to handle man hour requirements for the various types of work activities.

It should be noted that Task 6, in particular, requires essential policy decisions by police officers on the most effective and efficient service unit and manpower type for handling the diverse range of workload activities which occur in the field.

(2) Methodology

The methodology for determining field man hour requirements and the types of policing units for handling these workload activities is outlined below.

(2.1) Task 5 - Determining the number of field man hours required for each workload activity

In computing the number of field man hours required for each workload activity, two analytical steps will be required.

Initially, the number of work units defined and projected in Tasks 1 and 3 should be multiplied by the average and measured handling times calculated in Task 4. An illustrative format for making and displaying these simple computations is set forth in Exhibit XI, following this page. Completion of this step will provide the man hour requirements for handling each type of projected work unit in the major service areas of crime investigation, community service, crime repression and traffic control. This assumes only one individual handles each work activity.

The second step involves making a determination on how many additional man hours will be required to reflect the need for two or more field personnel handling the same workload unit. In making this determination several approaches can be taken:

- . The various patrol sectors can be analyzed to determine which ones (because of high crime incidence, assaults against officers, or other officer safety considerations) require two man policing units. Once these geographic areas have been defined, the caseloads and associated workloads generated by these areas can be computed and added to the man hour calculations estimated in the previous work step.

- . The various forecasted caseload volumes and other workload activities, by type, can be analyzed to determine the estimated number or percentage which generally require handling by two or more personnel. This evaluation results in the calculation of a "backup" factor for each type of work activity. Illustrative "backup factors" are set forth below:

EXHIBIT XI

ILLUSTRATIVE FORMAT FOR DETERMINING INITIAL FIELD
MAN HOURS REQUIRED FOR PROJECTED WORKLOAD ACTIVITIES

MAJOR SERVICE AREA	1. <u>CRIME INVESTIGATION</u>	NUMBER FOR NEXT YEAR	(times)	MEASURED MAN HOUR PER UNIT	(equal)	INITIAL FIELD MAN HOURS REQUIRED
Work Units	. Part I Cases (total)	<u>8,000</u>		<u>.62</u>		<u>4,960</u>
	- Burglary	3,500		.48		1,680
	- Auto theft	1,000		.63		630
	-	-		-		-
	. Part II Cases (total)	<u>30,000</u>		<u>.50</u>		<u>15,000</u>
	- Drunkenness	1,800		.32		576
	- Drug laws	400		.55		220
	-	-		-		-
	-	-		-		-
	. Reports written	<u>3,000</u>		<u>1.00</u>		<u>3,000</u>
	. Arrests	<u>20,000</u>		<u>.33</u>		<u>6,600</u>
	. Reports	-		-		-
	. Prisoner transportation trips	-		-		-
	. Warrants served	-		-		-
	Total					<u>XXXXX</u>
MAJOR SERVICE AREA	2. <u>COMMUNITY SERVICE</u>					
Work Units	. Part III Cases (total)	<u>15,000</u>		<u>.28</u>		<u>4,200</u>
	- Lost children	-		-		-
	- Public events monitored	-		-		-
	- Family dispute	-		-		-
	- Parade escorts	-		-		-
	-	-		-		-
	-	-		-		-
	. Reports written	-		-		-
	.	-		-		-
	.	-		-		-
	Total					<u>XXXXX</u>
MAJOR SERVICE AREA	3. <u>CRIME REPRESSION</u>					
Work Units	. Street Mile surveillance	<u>54,000</u>		<u>.07</u>		<u>3,780</u>
	. Crime prevention talks	<u>700</u>		<u>.33</u>		<u>231</u>
	. "On View" arrests	-		-		-
	. Counselling incidents	-		-		-
	.	-		-		-
	.	-		-		-
	.	-		-		-
	Total					<u>XXXXX</u>

EXHIBIT XI (2)

MAJOR SERVICE AREA	4. <u>TRAFFIC CONTROL</u>	NUMBER FORCASTED FOR NEXT YEAR	(times)	MEASURED MAN HOUR PER UNIT	(equal)	INITIAL FIELD MAN HOURS REQUIRED
Work Units	. Warning stops	<u>45,000</u>		<u>.08</u>		<u>3,600</u>
	. Parking citations	<u>20,000</u>		<u>.05</u>		<u>1,000</u>
	.	-		-		-
	.	-		-		-
	.	-		-		-
	Total					<u>XXXXX</u>
	Grand Total					<u>XXXXX</u>

<u>Policing Activity</u>	<u>Possible % of Time At Least Two Men Required For Handling</u>
Part I Cases	30%
Part II Cases	20%
Part III Incidents	15%
Traffic Accidents	30%
Reports Written	5%
Arrests	90%
Traffic Stops/Citations	5%
Parking Citations	5%
Street Mile Surveillance	NONE
Talks Given	NONE
Suspicious Persons/ Vehicles Checked	50%
House/Business Checks	5%
Other "Crime Stop" Contacts	20%
Stake Outs	75%

Once these "backup factors" are determined, they can be applied to the man hour requirements determined in the previous work step to establish total field policing man hour needs by type of activity.

Actual time spent in assisting another officer can be recorded on dispatch cards and maintained. However, these time requirements will require periodic field audits to determine whether these assists are at acceptable levels, too few, or too many.

It should be noted that a recent analysis of selected dispatch cards in a medium-sized police department using primarily one-man patrol units indicated that backup assistance was occurring on slightly over 30% of the calls handled. Whether this backup factor was high or low was not determined.

(2.2) Task 6 - Determining the man hours by type of field unit and personnel to handle forecasted workloads

Policy decisions by police and city officials, based on professional judgment and cost-benefit analysis, will be needed in determining why types of field policing units and personnel classifications should handle the man hour requirements calculated in Task 5. The various types of field policing units and personnel mixes to be considered include the following:

<u>Type of Field Policing Unit</u>	<u>Classification of Manpower Possible</u>
General purpose patrol unit (One man vehicle)	Patrolman or Police Agent
General purpose patrol unit (Two man vehicle)	Two Patrolmen; patrolman and police agent; patrolman and reserve officer; patrolman and either police cadet or community service aides
Traffic control unit (One man vehicle)	Patrolman (with perhaps pay bonus)
Parking control unit (One man vehicle)	Patrolman, meter maid, police cadet, or community service aides
Helicopter unit (Two man vehicle)	Two patrolmen; two sergeants; patrolman and sergeant; or other personnel mixes.
Specialized units for:	
. Warrant service	Various manpower mixes can be employed for specialized units
. Selective crime enforce- ment	
. Conspicuous patrol	
. Various community services	

In determining the allocation of man hours, by type of workload, for various types of field units and personnel classifications, the various factors to consider include:

- . Insuring that work activities in terms of their relative importance and skill requirements are performed by the most economical type of field unit and personnel class. For example: metered parking control can be performed by civilian meter maids on scooters; community service aides or police cadets in economy cars can handle abandoned vehicles, lost property reports and other activities.

- Determining what degree of specialization in field policing units is needed. For example: should traffic enforcement and accident investigation be handled by specialized motorcycle officers and police agents or general purpose patrol units; or who should serve warrants. . . specialized warrant officers or general purpose patrol units?
- Considering the impact of changing field policing tactics on types of service units and personnel mixes required: For example: the use of K-9 units, bicycle patrols, crises intervention teams, helicopter patrol, decoy teams, and other operational teams.
- Determining the degree of field supervision actually needed as police officers are upgraded in terms of formal education, in-service training and years of experience, or more decision-making is delegated to field policing units.

At the completion of this work task, the man hours of forecasted workload by type, should be arrayed against the types of policing units, as illustrated below:

<u>Workload Units</u>	<u>Total Forecasted Man Hours</u>	<u>Allocation of Man Hours Among Field Policing Units</u>		
		<u>Patrol Units</u>	<u>Parking Units</u>	<u>Police Agents</u>
Part I Cases	11,000	7,000	-	2,000
- Burglary	3,800	2,000		1,000
- Assault	2,000	1,500		400
- Auto Theft	1,100	900		200
Part II Cases				
-				
-				
-				
Arrests				
•				
•				
•				

This workload allocation display will provide maximum visibility of how much of the various types of field policing workloads will be handled by different types of service units and personnel.

(3) Task Responsibility

The determination of field man hour requirements (Task 5) is a straightforward task which can be readily performed by the planning and research unit. However, the Chief of Police and relevant division commanders will need to make a major policy decision on the question of where and how much two-man work handling teams will be employed. The completion of Task 6, determining what types of field units will handle the various man hours of work, will require initial cost-benefit studies by the research and planning unit and policy decisions by top command personnel.

(4) Considerations which affect decision-making in this work task

As indicated earlier, these two work tasks present police departments with several sensitive planning issues, including:

- . Resolving the continuing question of when and how much two-man patrol cars should be utilized. The pros and cons of this issue have been discussed in various studies and opinion remains split.
- . Obtaining reliable, current information on the degree of backup among field units which now exists and, through periodic field audits, assessing whether or not excessive "swarming" (too many units handling an incident) is taking place.
- . Providing the analytical time and resources to evaluate, in detail, the benefit and cost of various types of field units and manpower mixes to best handle different kinds of workloads.

TASK 7 - DETERMINE THE MANPOWER AVAILABILITY
FOR EACH TYPE OF FIELD PERSONNEL

(1) Purpose

The purpose of this work task is to determine the estimated number of man hours which each type of personnel are anticipated to be available annually to handle projected field policing workloads. This analysis results in a modified assignment/availability ratio which enables the specific number of field manpower, by personnel classification, to be determined in the next work task (Task 8).

This work task also provides the framework for:

- Identifying and analyzing potential time loss problems which may warrant correction, particularly those related to "street time" availability.
- Identifying the average time per man for holidays and court time which may require overtime compensation if departmental policies indicate that holidays are worked and court time normally is scheduled for days off.
- Making policy decisions regarding the amount of in-service training time to be provided.

(2) Methodology

The approach for determining the manpower availability for each type of field personnel is summarized, as follows:

(2.1) Determining the average number of man hours available per field personnel for field assignment

To determine the average man hours expected to be available for field assignment for each personnel classification, the following calculation should be made:

	Man Hours Available For <u>Field Duty</u>
• <u>Gross man hours</u>	
52 weeks x 40 hours	2,080
• <u>Less time off for:</u>	
Vacations	(XXX)
Holidays (if not worked and paid)	(XXX)
Sick leave	(XXX)
Injury leave	(XXX)
Attrition/Academy training	(XXX)
Military leave of absence	(XXX)
Educational leave of absence	(XXX)
In-service training	(XXX)
Court time (if not on days off)	(XXX)

• Net man hours available for field assignment per man	_____ _____

It should be noted that the determination of average time off requirements per man will need to be based on: (1) the aggregate number of lost days for all field personnel during the current year in each time off category; (2) divided by the average number of personnel available during that period; and (3) adjusted upward or downward depending on anticipated policy changes for the next budget period (such as longer vacations or reduced educational leave provisions).

In considering these anticipated time off requirements special attention needs to be given to:

• The average amount of time per man desired for in-service training. As the emphasis on police professionalism increases, more time can be anticipated for in-service training (excluding the time spent in briefing sessions). In the questionnaire survey set forth in the appendix of this report, 25 California police departments reported an average of 100 in-service training hours per police officer per year.

- . The lost time required to replace field personnel lost because of attrition or to fill new positions in departments with expanding field staffing levels. For each person lost or who needs to be added, academy training ranging from 10 to 14 weeks can be anticipated. This academy training, coach-pupil teaming arrangements needed for new officers for them to gain experience, and the time required to recruit new police officers can create a time loss replacement need of from 4 to 6 months for each sworn officer vacancy which occurs.
- . The average lost time per man which results from court appearances of field officers during their normal field duty time. For example, the manpower usage study by the Pasadena Police Department in 1967-1968 indicated that the judicial work activities of personnel in the Uniform Division (which consisted of on-duty appearance in court as well as warrant and subpoena service) constituted 3% of the time spent by Shift 1 personnel, 7% for Shift 2 personnel, 2% for Shift 3 personnel, 2% for motor officers, and 2.5% for parking control units. At least half of this time usage category probably pertains to on-duty court appearances.

It may not be necessary to continually calculate the average man hours available for field duty for each type of sworn personnel (patrolman, police agent and sergeant) if it's found that no significant differences exist in total time off requirements among these personnel.

(2.2) Determining the average number of man hours available per field personnel for "street" duty

Several steps should be taken to determine the average available man hours or percentage of time anticipated for each type of personnel for "street" duty (in the field and fully operational to handle community generated caseloads or officer initiated activities).

First, periodic workload analysis, through work sampling and officer time logging, is required to determine the amount and percentage of field duty assignment time which basically is not available for workload duties. This includes on-duty time spent in: briefings and other shift start-up activities; coffee and eating breaks; and personal time. The non-operational time of field units may be considerable. For example, field officer time usage by work categories contained in studies conducted in 1968 (in California

cities with 25,000 to 100,000 population) and 1970 (in the Long Beach Police Department) were averaged to provide the following profile of time utilization:

<u>Workload Categories</u>	<u>Average Man-Hours Spent</u>	<u>% of Total On-Duty Time</u>
1. <u>Non-Operational Time</u>		
. Roll Call	.20	2.5%
. Equipment checks	.26	3.3
. Coffee	.20	2.5
. Eating	.57	7.1
. Personal/other	<u>.12</u>	<u>1.5</u>
	1.35	16.9%
2. <u>Operational Time</u>		
. Patrol activities	2.84	35.5
-Roving	<u>2.35</u>	<u>29.4</u>
-Inspectional	.49	6.1
. Part 1/2 offenses	<u>.38</u>	<u>4.8</u>
-Part 1	.17	2.2
-Part 2	.21	2.6
. Report writing	<u>.53</u>	<u>6.6</u>
. Traffic	<u>.96</u>	<u>12.0</u>
-Citations	.33	4.1
-Accidents	.27	3.4
-Control	.29	3.6
-Drunk driving	.07	0.9
. Secondary Police Activities	<u>1.38</u>	<u>17.3</u>
-Field interrogation	.62	7.7
-Juvenile	.22	2.8
-Intoxication	.13	1.6
-General	.41	5.2
. General Services	<u>.24</u>	<u>3.0</u>
. Other	<u>.31</u>	<u>3.9</u>
3. <u>Total Time</u>	8.00	100.0

Second, once this non-operational time factor (expressed as a percentage) is determined and agreed upon, it should be deducted from the average net man hours available per man for field assignment previously calculated. However, in analyzing this non-operational street time percentage, attention should be directed toward what the non-operational time allowance should be rather than what it has been in the past. This time factor, if excessive, can significantly increase field policing manpower requirements.

(3) Task responsibility

The calculation of estimated manpower availability for field assignment and workload analysis to determine available street time should be done by the research and planning unit. However, key policy decisions will be required by the following participants:

<u>Participant</u>	<u>Responsibility</u>
City Council	Approving policies regarding vacation, holiday and sick leave provisions; budgeted in-service training time; and other time off requirements
City Manager	Recommending time off policies which require Council approval; and approving other time allowance guidelines
Police Chief	Proposing time off policies not related to negotiated fringe benefits like vacation, holidays, and sick leave; determining appropriate non-operational time allowances; and instituting regular controls over time usage which can be regulated
Unit Commanders and Supervisors	Control over field policing time usages and monthly reporting of actual time utilization of field personnel compared with established policies

(4) Considerations which affect decision-making in this work task

The methodology set forth in this work task in determining manpower availability should not be confused with the well known approach for calculating an assignment/availability ratio. Under this approach: (1) the potential man days available in a department are computed (number of full-time positions x 365 days); (2) the time loss for days off, vacation, sick leave, holidays, training and other factors are totalled and subtracted from potential man days available to determine actual man days available; and (3) actual man days available are divided into potential man days to determine the assignment/availability factor. This ratio, which usually is in the 1.60 to 1.64 range, means that for every man actually available for duty, at least 1.60 officers must be authorized. Therefore, it takes at least 1.60 men to man a post one shift each day for an entire year.

It should be noted that decision-making regarding the manpower availability of field personnel and control over this availability are affected by several considerations:

- . Police chiefs have little control over time off requirements for vacations and sick leave since they generally are negotiated as part of police fringe benefit packages. As these benefits are expanded, steps will need to be taken to provide sufficient field staff to cover these time losses.
- . In some states, briefing, eating and other non-operational time now come out of actual on-duty shift hours. As indicated earlier, this can significantly reduce the available "street time" of field policing personnel. However, procedures need to be instituted to prevent this non-operational time from becoming excessive.

- . If holidays are worked but paid and court time is handled on days off and paid, these overtime costs should be budgeted for in later work tasks which compute the forecasted costs of the field policing function.

Continuous analytical and policy attention needs to be directed at the various factors which reduce field manpower availability so that these various time loss factors are kept within acceptable limits.

TASK 8 - DETERMINE THE NUMBER AND TYPE OF FIELD PERSONNEL REQUIRED TO HANDLE FORECASTED FIELD WORKLOADS

(1) Purpose

The purpose of this work task is to convert forecasted man hours for handling field policing workloads by type of field personnel into estimated numbers of authorized personnel considering the manpower availability factors determined in Task 7.

(2) Methodology

The methodology for determining the number of field personnel by type to handle projected workload levels is to divide the projected number of workload man hours for each type of personnel classification (as computed in Tasks 5 and 6) by the average man hours available for each authorized position (as calculated in Task 7).

An example of this computation is summarized as follows:

Field Patrolmen Needed

Man Hours of Work Projected

. Crime investigation	26,300
. Community service	42,100
. Crime repression	47,400
. Traffic control	15,900
	<u>131,700</u>

Divided By Average Man Hours
Available Per Officer

. Gross man hours available	2,080
Lost before field assignment	<u>(296)</u>
	1,784
. Non-operational time allowance of 15%	<u>(268)</u>
	<u>1,516</u>
 <u>Number of Patrolmen Needed</u>	 <u><u>87</u></u>

(3) Task responsibility

Determining the number and type of field personnel required to handle forecasted field workloads should be the responsibility of the research and planning unit.

TASKS 9-12 - DETERMINE MANPOWER, EQUIPMENT,
FACILITY AND OTHER SUPPORT COSTS FOR THE FIELD
POLICING FUNCTION

(1) Purpose

The purpose of these four integrated work tasks is to determine the direct costs of the field policing function resulting from the resource requirements needed to achieve service objectives. The major expenditure categories to be considered include field manpower, equipment, facilities and other direct support costs. These four work tasks provide the framework for:

- . Determining the overall cost of field policing (which usually consists of the organizational cost of the Uniform Division in many police departments) and then specific types of service units.
- . Costing out different mixes of personnel and equipment which might be employed in handling projected workload requirements.
- . Cataloguing cost data which may be useful in assessing the benefit and costs of alternative approaches for providing field policing services.
- . Identifying the relationship or impact between possible changes in field policing costs and those of other organizational units in the police department.

It should be noted that the costing methodologies presented pertain primarily to the field policing function and are relatively simple to use. These methodologies do not encompass other departmental functions or organizational units like investigation, administrative services, technical services and so on.

REMOVED

REMOVED

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(2) Methodology

The methodologies for determining the manpower, equipment, facility and other support costs for the field policing function are outlined below:

(2.1) Task 9 - Determining individual and total manpower costs by personnel classification

To determine the manpower costs of the field policing function, several steps need to be taken, as follows:

- . Inventory the various personnel classes or types that are directly engaged in providing field policing services. Personnel classifications normally found include:
 - Policeman
 - Policewoman
 - Police Agent
 - Sergeant
 - Lieutenant
 - Captain
 - Civilian Analyst
 - Community Service Aide
 - Police Cadet
 - Police Clerk
 - Parking Representative
 - Crossing Guard
 - Reserve Officer
- . Compute the total compensation cost for a single position in each personnel classification which includes:
 - Annual salary at the highest or average salary step
 - Fringe benefits (usually expressed as a percentage of salary) including: retirement, insurance, OASI, uniform allowances, paid vacation, paid sick leave, and paid holidays
 - Special pay differentials, such as motor officer bonus, educational incentives, or flight pay
- . Compute the total overtime costs and classify this cost, if possible, by: off-duty court time; holidays worked; and normal overtime for extra work.

- . Calculate the total compensation costs for each personnel category by multiplying the average salary, fringe, special pay differential, and overtime cost by the actual number of available personnel.

In computing manpower costs by personnel classification, it should become apparent that:

- . The use of non-sworn personnel in positions normally filled by sworn officers usually provides a saving in fringe benefit costs.
- . Having work performed at the lowest possible level (like by a community service officer rather than policeman) can generate substantial salary savings.
- . Overtime costs, particularly those associated with off-duty court time, can be considerable since most departments pay for a minimum number of overtime hours each time an officer is required to appear in court.

(2.2) Task 10 - Determining equipment costs for field policing

Several steps are required to determine the equipment costs for the field policing function.

First, the types of equipment (primarily vehicles) must be established. These different equipment types will be determined by the policing tactics and methods required to achieve service objectives as well as economical considerations. Typical equipment types include:

- . Marked patrol sedans (fully equipped)
- . Unmarked sedans (partially equipped)
- . Economy sedans
- . Two-wheeled motorcycles
- . Motor scooters
- . Helicopters
- . Bicycles

Second, the amount of equipment needed must be established. To determine these equipment levels, several factors will need to be considered:

- . The peak and average number of manpower each shift who will require vehicles by equipment type, including the number of vehicles to be manned by two men.
- . The degree to which equipment is shared or pooled to increase utilization or assigned to individuals for exclusive use.
- . The average downtime by vehicle type for maintenance and repair.

Third, the cost of equipment required needs to be computed and annualized, as follows:

- . Yearly operating costs for fuel, insurance, supplies, maintenance and repair (parts and labor) should be computed.
- . Annualized depreciation costs should be calculated by taking vehicle purchase costs, less resale or salvage value, divided by useful life to the police department.
- . Annualized capital costs which represent the value or interest cost of the initial capital outlay if it were invested or borrowed.
- . Annualized operating and capital costs can be projected in terms of: (1) yearly costs per vehicle; or (2) the costs per mile or operating hour multiplied by estimated usage.

In estimating projected equipment costs for the field policing function, attention should be directed at:

- . Looking for opportunities to use the most economical type of equipment for the policing task being performed, like the use of compacts or, perhaps, scooters for subpoena service or handling abandoned vehicles.
- . Employing an economic replacement formula to determine when vehicles and equipment should be replaced by: (1) calculating annualized cost by equipment type for resale value lost, interest cost, and operations; (2) determining annual cost and cumulative average annual cost (which adds each year's cost and divides by the number of years); and (3) identifying the point of

economic replacement which is when cumulative average annual costs begin to rise.

(2.3) Task 11 - Determining facility costs for field policing forces

Facility or occupancy costs for the field policing function are determined by following a straightforward logical system.

First, the space directly used (in terms of square feet) by the field policing function needs to be inventoried. Common space uses include:

- . Parking or storage space for field vehicles, including helicopters, and other equipment like special firearms and riot gear.
- . Locker rooms for field officers.
- . Squad or briefing rooms, including training space.
- . Offices or work rooms for personnel engaged in the field policing function, like complaint clerks, dispatchers, watch commanders, and analytical personnel.
- . These space allocations should be added together and an allowance factor of from 1/4 to 1/3 added to account for internal corridors, partitions and access ways.

The capacity of each type of space should be determined (like number of staff it can accommodate) as well as the total gross space allocated to the police department.

Second, the annual occupancy costs of facilities for the field policing function should be computed by:

- . Determining annual operating costs for all police facilities for such cost factors as insurance, utilities, maintenance, and housekeeping.
- . Calculating annual depreciation for all police facilities by taking construction and fixed equipment costs, and interest costs (if any), and dividing by the estimated useful life of the structures involved.

- Divide the space specifically allocated to field policing functions by the total gross space of police facilities (in square feet) to determine the percentage of space applicable to field policing.
- Adding annual operating and depreciation costs for all police facilities and multiplying this occupancy cost by the percent of space allocated to field policing.

It should be noted that the occupancy costs for the field policing function may not be particularly sensitive to annualized changes in field policing service levels and resource requirements unless: (1) a large number of personnel or equipment are added and existing facility capacities require expansion; or (2) a major police facility construction or modernization program is completed, including either decentralizing or centralizing field policing facilities.

(2.4) Task 12 - Determining other direct support costs

Other direct support costs for field policing consist primarily of items which fall into the "operating expense" category like communications, printing, minor equipment purchases and repairs, professional fees, publications, conference and training expenses, office supplies and so on. These items usually account for only 3% to 5% of the annual cost of the field policing function and generally are not significantly sensitive to changes in manpower and equipment levels and mixes.

(3) Task Responsibility

Determining the forecasted costs of the field policing function (Tasks 9 - 12), particularly manpower and equipment, should be the responsibility of the department's budget unit.

(4) Considerations which affect decision-making in this work task

Completion of these four work tasks will be affected by a number of issues, including the following:

Basic data limitations, particularly in obtaining:

- Accurate fringe benefit cost data for field policing which often are not included in the police department budget but are treated as separate citywide budget accounts
- Overtime cost information for field policing which can be analyzed in terms of its different uses like court time, holidays worked, and normal extra duty time
- Training cost data for field policing for academy and other in-service training activities
- Equipment utilization and downtime information for field equipment
- Cost data for equipment operations and depreciation for field policing which can be used for replacement planning as well as comparing and analyzing the unit costs of different types of equipment
- Operating and depreciation costs for police facilities and the capacities of these facilities to analyze how changing workloads and resource levels will affect facility requirements

Developing adequate guidelines for determining:

- When various types of field policing equipment should be replaced, based on the economic replacement point rather than number of miles driven or an undocumented "X" years of service
- The downtime factor for various types of equipment which probably is up to 20% for patrol and traffic units on a multi-shift use basis and up to 10% for less utilized vehicles

- When and what types of equipment can be pooled to increase their utilization and minimize equipment requirements. For example, in several cities, some fully equipped and marked vehicles are used by investigative personnel in the day time to reduce the number of marked vehicles needed only in the evening when peak field work periods and manning occur.

Although this particular study focuses attention only on the field policing function (particularly workloads, service level objectives, resource requirements and costs) it's obvious that this function impacts, in various degrees, upon other departmental services, resources and costs. While this impact cannot be analyzed in any depth now, the possible resource and cost relationships are identified in Exhibit XII, following this page. It should be noted that the degree to which changes in the field policing function will affect other service units depends, in large measure, upon the work processing capabilities of these units. It is unlikely that many departments have conducted comprehensive work measurement and methods improvement studies to determine these capacities.

EXHIBIT XII

GENERALIZED RELATIONSHIPS BETWEEN THE FIELD POLICING
FUNCTION AND OTHER DEPARTMENTAL FUNCTIONS

1. INVESTIGATION SERVICES UNIT

Increases in field policing workloads could have a significant impact upon the resource needs and costs of the organizational unit responsible for specialized and follow-up investigations. The extent of this impact will be determined by: (1) policy decisions on the extent to which field police conduct follow-up investigations and when specialized investigators take over; (2) the number and percentage of cases referred to investigators which receive a courtesy, initial and in-depth follow-up (determining the ejection factor); (3) service level objectives on desired and realistic case clearance ratios; (4) workload analysis of the average time spent and desired to conduct a follow-up case investigation, by type of case, as well as handle court related, administrative, training and non-job related tasks; and (5) operational methods for handling investigations, including one or two man teams and report writing.

The Vice-Narcotics Unit generally generates its own workload through various types of investigations, including undercover, or "on-view" actions and probably won't be significantly affected by changes in the field policing function.

2. RECORD SERVICES UNIT

Changes in the field policing function could have a major impact upon the record-keeping unit if: (1) officer reports are dictated or typed by records personnel; (2) field operations data (other than case reports) are maintained by this unit; or (3) commonly generated called for services, or officer initiated actions greatly expand. An analysis of record processing methods and establishment of time standards for various record keeping tasks will be needed to quantify the extent of this relationship.

3. COMMUNITY RELATIONS UNIT

The field policing function could have impact upon the community relations unit if field personnel either substantially increased or decreased their formal role and participation in community relations. However, the trend seems to be to use community relations units in a programming and coordination role with field policing personnel becoming more heavily involved in these formalized programs.

4. OTHER SERVICE UNITS

Changes in the service levels, operational tactics and resource levels of the field policing function can impact upon other service units in a police department in a variety of ways. The estimated impact and factors to consider are summarized below:

- . Public information - negligible impact
- . Finance - negligible impact
- . Property and supplies - modest impact depending on property and evidence storage capacities

- . Laboratory - ranging impact depending on work handling capacities, law enforcement emphasis (like drugs) and sophistication of crime scene analysis
- . Jail - possible heavy impact if bookings and temporary detention either significantly increase (and capacities are exceeded) or decrease (like through use of field citations)
- . Training - ranging impact depending on the comprehensiveness of existing academy and in-service training programs and their capacities in handling trainees
- . Internal Affairs - ranging impact depending on the volume of complaints against officers, degree to which field inspections are conducted, and investigation processing capacities
- . Personnel Management - ranging impact depending on vacancy rates, difficulties in recruiting police manpower (the labor supply), the degree of involvement of this unit in salary/classification administration and performance appraisals and work processing capacities
- . Planning and Research - ranging impact depending on their involvement in operations planning and analysis
- . Vehicle Maintenance - ranging impact depending on vehicle maintenance requirements and work processing capacities
- . Communications - ranging impact depending on dispatching and complaint handling capacities and sophistication of field command and control systems

TASK 13 - COMPARE FIELD POLICING COSTS
WITH AVAILABLE FUNDS

(1) Purpose

The purpose of this work task is to determine whether projected costs for the field policing function to meet service levels are compatible with estimates of the funds to be available during the next budget period.

(2) Methodology

The methodology for comparing projected funding requirements with financing levels which may be available is affected by several considerations:

- . City councils and city managers generally look at the proposed cost of the entire police department and not just the field policing function. Therefore, police administrators will need to budget for total departmental costs. However, they can highlight the cost of the field policing function so that it receives special attention.
- . City councils and city managers vary in terms of the pre-budget policy and planning direction provided to each municipal department, including the police. These approaches include:
 - Having each department submit operational plans and budgets on what it wants regardless of the anticipated funds available
 - Indicating a "hold the line" cost posture should be maintained
 - Designating several municipal service areas which will receive funding priority like police or park development or pollution control

- Requiring a "0" budget approach which necessitates that each department document and justify all expenditure requests even though many programs are traditional in nature
 - Focusing attention on "service improvement" programs and costs and indicating existing services that should be budgeted in order to meet workload increases
- . The anticipated increases in salaries and fringe benefits for police and other municipal personnel significantly affects decisions by the council and city manager regarding the funding levels to be made available.

Given these considerations, the determination of whether projected costs for field policing are compatible with funding levels can only be arrived at through negotiations between the chief and city manager and then the city manager and city council. Ideally, this process should include:

- . Having the council, manager and chief agree tentatively upon various service level objectives as described in Task 2 prior to undertaking the analytical work tasks previously described.
- . Having the police department continuously review the cost and benefit of alternative approaches and resource requirements for achieving these service level objectives, (as will be described in Task 14) and making the results of these analyses known to the council and manager.
- . Making certain the council and manager clearly understand those areas where policy decisions on their part are needed and the impact of these decisions on resource needs and operational costs.

If, after this negotiation process, it is determined the available funds to be committed for field policing are insufficient, then service level objectives and associated resource requirements will require adjustment or less costly alternatives for achieving these objectives will need to be analyzed.

(3) Task responsibility

The city council and city manager must assume responsibility for comparing field policing costs with available financing levels.

TASK 14 - ANALYZE THE BENEFITS AND COSTS OF
ALTERNATIVE APPROACHES FOR PROVIDING FIELD
POLICING SERVICES

(1) Purpose

The purpose of this work task is to provide an on-going analysis of the benefits (advantages) and costs (disadvantages) of alternative approaches and methods for providing field policing services: (1) at acceptable levels; (2) of satisfactory quality; (3) efficiently; and (4) economically. This work task is a critical part of the performance-cost decision-making system since:

- . It requires police administrators and operations personnel to continually question existing ways of delivering field policing services rather than accepting the status quo.
- . It requires that alternative approaches for achieving each service level objective and delivering each type of police service be identified, particularly those related to manpower utilization which is largest cost category in field policing.
- . It requires that the benefits and costs of alternative solutions to field operations problems be fully explored, documented, and evaluated against each other.

It should be noted that the benefit and cost analysis of alternative approaches for performing the field policing function can be conducted at various stages in the performance-cost decision-making system, including:

- . Determining the types of community generated caseloads that the field police should handle, how and by what type of policing unit.

- . Determining the types and volumes of officer initiated activities that should be generated, how and by what type of policing unit.
- . Determining how time loss problems which affect daily manpower availability and operational street time can be reduced.
- . Determining other ways for improving field policing services or better controlling associated costs.

The logic system employed for assessing the benefits and costs of field policing alternatives is structured to:

- . Aid decision-making in identifying and solving field policing problems of a management or operational nature. Measures of benefits or cost of alternatives, therefore, are not defined in terms of their potential impact upon crime levels or the cost of various crimes to society.
- . Provide a relatively simple analytical methodology which can be exercised by medium-sized police departments (with limited data bases) and is not dependent upon heavy computer usage or in-depth understanding of advanced statistical techniques.

In discussing the benefit and cost methodology presented, the following terms require definition:

<u>TERMS</u>	<u>DEFINITION</u>	<u>EXAMPLE</u>
Objective	The end result of a field policing program or activity which is capable of attainment and measurement	Reduction of response time; increase of geographical coverage and surveillance by police; decrease of non-productive officer time uses
Alternative	Two or more approaches toward achieving the same objective	Adding x patrol units or balancing existing patrol units more in accordance with expected workloads are alternatives for reducing response times
Benefit	Achievement of a field policing objective/improvement in field operations	Decrease of response times to emergencies to an average of two minutes
Optimum	Best, most favored, maximum net benefit within imposed limits	A crime repression program which increases miles covered in random surveillance by 25% within a budget limitation

<u>TERMS</u>	<u>DEFINITION</u>	<u>EXAMPLE</u>
Cost	Expenditure level needed to perform a field policing activity	The annual compensation costs and yearly motorcycle rental cost for a traffic unit operating 40 hours per week
Output	The quantity of service generated by a field policing activity	Miles of street patrolled, number of vacation house checks performed
Program	A grouping of field policing activities, all directed toward a common objective	Operation of a helicopter patrol, conspicuous patrol, property marking efforts, and citizen crime alert system as activities in a burglary reduction program

(2) Methodology

The methodology for analyzing the benefits and costs of alternative field policing approaches and methods is outlined below:

(2.1) Developing an adequate understanding of current field policing responsibilities and operations

Before benefit and cost analysis of the field policing function can be conducted, analysts and decision-makers should have an adequate understanding of the responsibilities, goals, workload and operating characteristics of the field policing function. Exhibit XIII, following this page, provides a checklist of questions which can be asked to assess general knowledge levels and gaps regarding field policing. Gaining this understanding is not an idle exercise since various mystiques exist regarding what field policing forces do, their workloads and performance levels.

(2.2) Identifying and documenting field policing issues which would profit from benefit and cost analysis

Issues can represent a variety of possible problems in the field policing function, including:

EXHIBIT XIII

CHECKLIST FOR ASSESSING KNOWLEDGE LEVELS OR GAPS
REGARDING THE FIELD POLICING FUNCTION

- Do you know the workload levels and trends (community generated cases and officer initiated activities) over the past five years?
- Do you know how the field policing function is organized internally and the responsibilities or functions of each unit?
- Do you know the input (particularly staffing) and work output trends over a five year period for various types of field policing units?
- Do you know the various types of work performed by these units?
- Do you know why these types of field police work are performed and what they intend to accomplish?
- Do you know for what persons or groups in the community these types of work are performed?
- Do you know what methods, improvements and work output standards have been developed for these units?
- Do you know the specific operational objectives which have been established for the field policing function?
- Are you aware of new approaches which are being tried elsewhere for field policing and their success or failure?
- Do you know how successful field policing units have been in meeting their responsibilities and achieving objectives?
- Have you ever observed field policing units in operation for an entire watch?
- Do you know what have been the high priority operating problems among field police units during the past five years?
- Are you familiar with the regular performance or work status reports which are generated by field police, particularly progress against objectives?
- Have you studied previous reports or studies on the field police and the status of recommendations made?
- Do you know who has responsibility in field policing for "internal analysis" and budget preparation? Have you talked with these individuals?
- Do you know how command personnel at various levels in field policing feel about their problems and possible solutions?
- Do you read regularly the professional journals which pertain to law enforcement and policing?
- Are you aware of performance measures or standards which have been developed in other departments regarding field policing?
- Are you aware of national reports or surveys (such as The President's Commission on Law Enforcement and Administration of Justice) which have been developed on policing?
- Do you know someone (outside of the department) who has "program expertise" in the area and who can be used as a "sounding board" for ideas?

- How an existing policing program should function

(e. g. should selected traffic accident control be based on a high volume vehicle stop/warning program or the more traditional stop/citation/penalty system?)
- Whom an existing policing program should serve

(e. g. should the community relations program conducted by field personnel focus on the entire city, teenagers, adults, crime prone areas?)
- When a new program should be instituted

(e. g. is a "crisis intervention" program with officers specially trained in dispute handling needed?)
- Why an existing program should exist

(e. g. does the city need a parking control program in the downtown area?)
- When an existing program should be altered

(e. g. should the monthly field manpower deployment schedule based on historical workload data be accelerated to weekly changes in deployment pattern based on projected workloads?)
- How an existing field program relates to a problem

(e. g. does conspicuous patrol increase the number of crimes detected?)
- How several programs relate to a problem

(e. g. should emphasis be placed on two-man units, tandem patrol by two vehicles, more inter-car communication frequencies, or training to increase officer security?)

The identification of field policing issues for further documentation and analysis comes from a variety of sources, including:

- . Issues deemed important by the city council, city manager, and community groups through their various exposure to policing services and problems like:
 - Slow response times
 - Speeding on residential streets
 - Delays in reaching the police by telephone
 - Never seeing a field unit in the neighborhood
 - Rising police service costs
 - Feeling of being unsafe and having a high crime rate
 - Too many traffic accidents

- . Issues deemed important by police administrators at various management levels like:
 - Field units being too busy on certain days and shifts
 - Excessive vehicle downtime
 - Too much court time
 - Inadequate in-service training

- . Issues considered important by field policing officers like:
 - Officer security
 - Incomplete or vague information given on dispatches
 - Handling non-police related workload tasks
 - Being over-supervised
 - Excessive and elaborate report writing

- . Issues uncovered by an on-going program of operations analysis like:
 - Excessive off-duty, non-operational, or case handling time
 - Inefficient or uneconomical work processing methods based on traditional practices
 - Use of expensive and highly trained manpower on low priority work tasks
 - Incompatibility of departmental policing practices with newer programs or operational techniques being used in other police departments

In the issue identification process, attention also needs to be directed to the following considerations:

- Closely examining field policing programs and activities in light of formalized service level objectives to determine: (1) if these programs are generating intended outputs and achieving stated objectives; (2) if there is any real indication that the community wants or needs these outputs; and (3) if there is reason to believe that there are alternatives to produce more outputs for the same costs or in a cheaper way.

For example: (1) if it's agreed that about 30% of the cases police handle should require backup from another unit and backup is occurring on 38% of the cases, then an issue or problem might exist; or (2) if it's agreed that a reasonable caseload handling output of an officer on duty is five cases during a 10-hour watch and actual caseloads per available officer average three on the day watch and seven in the evenings, a manpower deployment issue might exist.

- Closely examining the nature of caseload problems being addressed by the field policing function and changes in these caseload levels, by type, to determine: (1) if and how various policing activities can have impact on these caseloads; and (2) the reasons for and relevance of these caseloads. For example: (1) if large-scale and costly crime prevention programs, like increased police street and aerial surveillance, have little visible impact on crime rates, is it because: major increases are occurring in cases like aggravated assault which are not repressible; certain caseload expansions are more directly related to addiction, unemployment, or crime prone population changes; or the lack of fear of being apprehended is increasing; or (2) if caseloads are expanding rapidly, is it because: police are encouraging citizen calls; or are certain case level changes, like thefts over \$50.00, being caused by officer over- or under-evaluation of property stolen or price increases in items stolen like bicycles.

The end product of the issue identification process is a precise and, hopefully, quantitative definition of the nature and magnitude of important field policing management or operational problems. To determine the relevance of these problems, they:

- . Should have significant magnitude to warrant the analysis of possible solutions or are growing at a relatively rapid rate.
- . Should be clearly defined and quantified
- . Should be capable of reduction by actions of field policing forces.

For example, in applying these criteria to potential operational problems in a police department, it could be found that:

- . Police handling of low-priority work tasks is considered a problem but the actual volume of these activities is only 500 incidents which takes an average of 250 man hours annually. In a medium-sized department, this problem, once documented, would hardly warrant further analysis.
- . Non-operational street time of officers on duty due to excessive briefings, eating and break time might be found to average 18% for a department with 60 officers available for field duty each day. This represents an operational time loss of 86.4 man hours per day and probably would justify additional analysis.

In defining and documenting field policing operational problems, the intelligent use of available data is anticipated while using sampling techniques to obtain information not regularly collected. Where data is not available, assumptions or estimates may be required. However, major data "gaps" or "lags" should be highlighted for subsequent review and possible improvement in the department's field policing data base.

Problem documentation should include: (1) a narrative statement of the problem with each aspect broken down and described fully; (2) a discussion of potential or possible causes of the problem and the extent to which they are presently known; (3) a quantification of the existing size of the problem, including the size and characteristics of the group affected or involved in the problem; and (4) a forecast of the magnitude of the problem in the future.

(2.3) Formulating objectives and measures against which alternative solutions can be compared

Once field policing management and operational problems are defined and documented: (1) objectives (end results) should be determined toward which alternative solutions are focused; and (2) measurement criteria established against which progress toward objectives can be evaluated.

If, for example, inadequate visible crime and traffic accident repression activities have been defined and documented as a problem in the city's residential areas, objectives and measurement criteria might be stated as follows:

. Objective

Provide roving and visual surveillance of residential sectors of the city during the hours law and traffic violations are significant while minimizing the manpower and associated costs required.

. Measurement Criteria

Desired number of crime and traffic stop contacts by type of activity per high violation hours per week; desired miles of residential streets and alleys under roving surveillance per high violation hours per week; and lowest cost per field hour of desired roving and visual surveillance.

It should be noted that the objectives and measurement criteria required to conduct a benefit and cost of analysis of alternative field policing approaches are similar to and compatible with the service level objectives and measures set forth in Task 2. The only difference is that these former objectives and measures: (1) may be defined in greater detail since they serve, in large measure, as an essential criteria against which the benefits of alternative solutions are tested; and (2) are structured toward a specific field management or operational problem.

The types of objectives and measurement criteria formulated will vary depending on the nature and extent of the field policing problem which has been documented. Illustrative types of field policing objectives and measurement criteria for possible field policing issues or problems are set forth in Exhibit XIV, following this page.

EXHIBIT XIV

ILLUSTRATIVE OBJECTIVES AND MEASUREMENT
CRITERIA FOR USE IN BENEFIT AND COST ANALYSIS
OF ALTERNATIVES FOR SOLVING VARIOUS FIELD
POLICING PROBLEMS

Possible Objectives

Possible Measurement Criteria

- | | |
|--|--|
| <ul style="list-style-type: none">• Provide field units with adequate time for crime repression activities | <p>Maintain an average of 33% of available "street" time for use in crime repression</p> |
| <ul style="list-style-type: none">• Allocate community generated caseloads equitably among field policing units | <p>Maintain a differential not to exceed 10% in the average time required among each available field unit for handling called for services by watch and day</p> |
| <ul style="list-style-type: none">• Minimize the time required to respond immediately to a citizen's need for an emergency service | <p>Maintain an 85% probability that a field unit will be immediately available for an emergency dispatch and will arrive in two minutes or less</p> |
| <ul style="list-style-type: none">• Provide minimum involvement of field police officers in low priority and non-police related service requests | <p>Maintain a percentage not to exceed 10% of the time used by field police for called for services on low-priority incidents</p> |
| <ul style="list-style-type: none">• Provide sufficient and prompt backup to field policing units when required | <p>Maintain a 95% probability that support from another field unit will be immediately available within one minute in 30% of the total cases handled by field police considered to require backup.</p> |
| <ul style="list-style-type: none">• Minimize the time required for report writing | <p>Maintain a ratio 1:2 of reprot written to cases handled</p> |
| <ul style="list-style-type: none">• Provide adequate visual surveillance of commercial and residential areas | <p>Maintain an average of 120 miles of visual surveillance per shift per day</p> |
| <ul style="list-style-type: none">• Provide adequate personalized relationships between field policing personnel and the specific neighborhoods they serve | <p>Maintain an average of one neighborhood and one school meeting between residents and police personnel every three months</p> |
| <ul style="list-style-type: none">• Provide for adequate and specialized crime scene analysis in the initial handling of major criminal cases | <p>Maintain an immediate and on-site crime scene investigation of 35% of the Part I cases initially investigated</p> |
| <ul style="list-style-type: none">• Provide adequate field supervision of field policing personnel | <p>Maintain a ratio of 1:9 for field sergeants to field units</p> |

The validity of the various problem oriented objectives and measures which are established will depend on: (1) the professional judgment of police administrators; and (2) the results of continuing operations analysis and field experimentation within the department and other law enforcement agencies.

(2.4) Identifying alternative approaches or methods for solving the problem and achieving specific objectives

The next step in the analysis of field policing issues is the identification of alternative approaches or methods to solve a defined problem. This is a key stage in benefit and cost analysis since, historically, the number of alternatives considered in policing has been overly restricted. The search for alternatives can be improved by seeking answers to the following questions:

- . What current police department programs or operations now have a positive or negative impact on the problem regardless of the organization unit?

(e. g. if excessive response time is a problem, are delays in the dispatching unit contributing to this problem?)

- . What other city departmental programs or operations now have a positive or negative impact on the problem?

(e. g. if too many low priority work tasks are being performed by the police, is it because another department has failed to handle the responsibility, like inspecting for business licenses?)

- . What non-city programs or operations now have a positive or negative impact on the problem?

(e. g. if the delay in reporting crimes is excessive, are these delays due, in part, to difficulty in finding the police telephone number in directories or too few public telephones?)

What new program or operational concepts should be considered to solve the problem?

(Here is where effort should be concentrated -- with police decision-makers and analysts drawing upon the ideas being attempted in other law enforcement agencies and internal operations analysis)

In identifying field policing alternatives, attention needs to be concentrated on the causes of the problem or how it is manifested. For example, in field manpower utilization, an objective might be to reduce the time and cost required to write reports. Alternative ways of achieving this objective would focus on ways to eliminate the causes of this problem (like writing reports on minor incidents, not monitoring report writing time, not using available dictating devices, or requesting too much information on reports).

The identification of alternative approaches for providing field policing services to solve management or operational problems probably will focus upon: (1) different personnel mixes and skills hierarchies which can be used to handle field policing workloads; (2) different types of equipment which can be used to process workloads and provide service; (3) different techniques or controls which can be employed to save field policing time; (4) different practices which can be used to schedule and deploy manpower in the field; and (5) different tactics for meeting field policing service responsibilities.

Exhibit XV, following this page, provides a listing of some alternative approaches being used or tested by municipal police departments to provide field policing services at adequate levels within cost limits.

(2.5) Evaluating the benefits of alternatives identified

Once possible alternatives have been identified, the relative benefits of each one require evaluation. In attempting to measure the benefits of various alternatives, a number of criteria should be utilized. From an analytical standpoint, a specific alternative for solving field policing management or operations problems provides a "benefit" depending on:

EXHIBIT XV

ALTERNATIVE APPROACHES BEING USED OR TESTED TO PROVIDE FIELD POLICING SERVICES AT ADEQUATE LEVELS WITHIN COST LIMITS

Background: During the course of the study, information was gathered through interviews, literature searches, questionnaires and observations of police operations to identify alternative strategies, tactics or methods being used or tested by police departments to provide field policing services: (1) at acceptable levels; (2) of adequate quality; (3) efficiently; or (4) in an economical fashion. These various approaches, which have not been evaluated to assess their possible benefits or costs, are summarized below.

- (1) Developing and installing formal work measurement systems to monitor the actual utilization and work output of various types of personnel against average time requirements (either actual or desired) for different work activities
- (2) Increasing the use of a central complaint desk staffed by lower cost civilian personnel, police cadets, light duty officers, or retired police officers working part-time to take low priority case reports by phone (like minor property damage, accidents, lost and found property reports and missing person reports) and avoid the dispatch of a motorized field unit.
- (3) Counselling with residents and businesses with a high number of false alarms on steps to take to minimize this problem, using a call back procedure to check on the alarm validity, referring them to private property protection agencies, or reducing the number of field units responding to chronic offenders
- (4) Transferring certain public service requests to other agencies like animal problems (to animal protection organizations), emergency medical care (to fire departments or ambulance services), lockouts (to filling stations), maintaining traffic signs or parking meters (to other city departments), regulating businesses or issuing licenses (to other public agencies); and family disputes (to mental health agencies)
- (5) Using less expensive personnel (like cadets, community service officers, reserve officers, or explorer scouts) for processing abandoned vehicles, vacation house checks, controlling traffic and crowds at public events, issuing subpoenas, parking control, monitoring school crossings, and jockeying cars being serviced
- (6) Eliminating police involvement completely in providing escort services and messenger services
- (7) Issuing field citations rather than physical arrest and booking for individuals accused of minor crimes like petty theft and disturbing the peace
- (8) Using small teams of specialists to selectively enforce laws regarding serious traffic violations, engage in handling "vertical" policing crime repression activities, or work with schools.
- (9) Reducing the size of traffic enforcement units to increase the number of field personnel available to handle the full range of field policing workloads, including traffic enforcement and patrol. Reducing bonus pay requirements for motorcycle officers
- (10) Using dictating systems, incident only reporting or simplified report forms to reduce officer time requirements in report writing

EXHIBIT XV (2)

- (11) Reducing the time spent in watch briefings on duty time by such approaches as: taping and playing material over the air to units in the field or through play-back devices in cars; showing training video tapes at briefings; improving the preparation for briefing time and subjects presented; or strengthening supervision over this time use
- (12) Reducing the amount of non-operational duty time for eating, breaks, slow start up and early watch completion through strengthened field supervision and operations audits
- (13) Equipping all field units with walkie-talkies (which may link to the car radio to relay transmissions) to encourage officers to leave vehicles when foot patrol or investigation is desirable as well as strengthen officer security
- (14) Using bicycle patrols in certain appropriate crime repression situations like strongarm robberies in parks
- (15) Eliminating regular foot patrols except in fully justifiable situations
- (16) Employing primarily one man field units to provide expanded geographical coverage and manpower distribution, more units to respond to service requests, and avoid dual manpower requirements to handle workloads
- (17) Using two, separate one-man vehicles patrolling in tandem to achieve expanded field manpower distribution while providing readily available officer backup potential
- (18) Using a reserve officer, police cadet, community service officer, or new police academy graduate in pupil-coach arrangement when two man vehicles are used
- (19) Reducing "swarming" or the excessive involvement of multi-field units in individual caseload handling through strengthened field supervision, operational audits and time utilization reporting
- (20) Using K-9 units (man and dog) for premise searches, crowd control and other selected crime repression activities
- (21) Reimbursing the police department for certain extra public events monitoring or guard duty activities by off-duty field officers assigned by the department
- (22) Dedicating specific one-man field units for conspicuous patrol and other crime repression activities and either one or two-man units to answer called for services
- (23) Establishing improved dispatching policies and procedures to determine the appropriate number and type of field units for dispatch by type of call, time of day and geographic area
- (24) Regularly (daily or weekly) deploying field manpower by time of day and geographic area to evenly balance forecasted shift workloads and expected time requirements against available field manpower
- (25) Using off-duty officers on an overtime basis to work peak but infrequent field workload periods rather than authorizing one or more new full-time positions
- (26) Using experienced and high performance field officers (classified, possibly, as police agents) to handle the most complicated, sensitive and demanding field policing tasks (like crime scene analysis, serious traffic accident investigation and crowd control)

EXHIBIT XV (3)

- (27) Transferring injured and light duty field policing officers to other units and replacing them with sworn personnel able to perform field duties.
- (28) Assigning selected field policing personnel to work exclusively and full-time with the schools in delinquency control, community education, community service and other crime repression activities
- (29) Assigning field policing personnel to the same geographical area to increase their knowledge and understanding of its unique crime and community service characteristics and needs
- (30) Conducting evaluations of field policing operations and manpower usage through regular crime audits and staff inspections
- (31) Expanding the traditional supervisory spans of field sergeants to officers from 1:6 to 1:9 to take into account the increased educational background and professionalism of field personnel
- (32) Maximizing the time which field sergeants spend in the field in effective supervision, tactical planning, and staff development
- (33) Reducing the need for field personnel to obtain approval from field sergeants on routine or common place decisions
- (34) Using experienced and trained civilians in the field policing function for operations planning and analysis tasks
- (35) Programming the non-called for service handling time of field units to insure it's effectively used in crime and accident repression
- (36) Using an operational team approach to police various geographical areas and between field personnel and investigators
- (37) Using overlapping shifts to provide peak field manpower during the highest workload periods
- (38) Batching low priority service requests (like vacation house checks or minor neighborhood complaints) for uninterrupted sequential handling
- (39) Using the 4/10 plan to reduce by 20% the unproductive time lost in shift start-up and completion per officer as well as overtime requirements
- (40) Developing improved officer scheduling procedures with the courts to reduce both off-duty and on-duty court appearance time for field police
- (41) With the approval of judges and consent of alleged traffic law violators, using the written disposition of officers on contested traffic cases rather than the court appearance of officers
- (42) Using nearby or departmental temporary detention facilities for overnight stays of persons in custody to reduce prisoner transportation time for booking and arraignment
- (43) Having all reports hand printed or written rather than typed or dictated and typed by clerical personnel
- (44) Allowing field officers to complete the investigation of cases where no follow-up by detectives is possible or needed

- (45) Using a radar unit in tandem with solo motorcycle officer for selective traffic enforcement at high accident locations
- (46) Using field policing personnel on community planning teams which focus on how to improve the relationship of physical planning and crime repression so that crime opportunities are minimized
- (47) Automating the wanted/warrant system to reduce the standby time of field officers waiting for a reply to an information request
- (48) Installing automatic vehicle monitoring systems, coupled with computer assisted dispatching systems, to constantly track the location of police vehicles and automatically dispatch the nearest available field unit by type of call and unit
- (49) Installing in-car input/output devices, including teleprinters, to inquire about and retrieve information needed in field operations from computer bases police data systems
- (50) Sharing mobile police training facilities among several smaller departments
- (51) Using infra-red surveillance equipment for night patrol
- (52) Using computerized crime and other caseload prediction procedures and systems
- (53) Using magnetic sensor devices to detect concealed weapons
- (54) Installing three-way radio equipment to permit field units to communicate directly with each other
- (55) Using videotape equipment to record arrests and other on-scene incidents
- (56) Developing a simple, short range signaling device that permits an officer on foot to signal the police vehicle and trigger an automatic call for help
- (57) Transmitting lower priority but desirable reporting functions over data channels rather than voice channels
- (58) Using probability theory in randomly assigning patrol units to geographic areas equal in crime potential to reduce response time
- (59) Altering, periodically, the functions of field units from patrol to answering calls and vice versa to provide greater blocks of uninterrupted crime repression time
- (60) Using a motorized officer and a foot policeman as a patrol team in a specific beat with periodic switches of these two personnel between motorized and foot patrol
- (61) Having motorized, one-man field units periodically park their vehicles and patrol on foot
- (62) Using horse units for large crowd control and park patrol
- (63) Employing undercover and zero visibility patrol vehicles and tactics for crime repression of street crimes
- (64) Using field policing units in scheduled "coffee klatches" or "rap sessions" with neighborhood groups

- (65) Recruiting experienced officers, On a lateral entry basis, from other law enforcement agencies, reserve officers, or police cadets to fill vacancies and reduce the time lost from new personnel in academy training and coach-pupil arrangements
- (66) Using less expensive vehicles like scooters and economy cars for transportation requirements in lower priority and generally non-crime field policing work tasks
- (67) Increasing the number of years a police vehicle is used and decreasing annual costs by determining their economic replacement point.
- (68) Assigning all cars for detectives into a pool for common use, with a percentage being marked vehicles, to reduce the need for additional marked vehicles for field policing during peak work-load periods in the evening
- (69) Using formalized preventative maintenance and first watch vehicle repair programs to reduce the downtime of police vehicles
- (70) Reducing response times to high-priority calls for service by: using the 911 emergency number; "hold and re-ring systems" to reduce crank calls; interrupting low-priority calls; dispatching cars across beat boundaries; encouraging the installation of silent alarms; providing officers with better information on the seriousness of the call; adding more complaint clerks or dispatchers; or adding more in-coming telephone circuits
- (71) Using helicopter patrols for: crime repression surveillance (particularly burglaries); emergency transportation; pursuing fleeing offenders; back-up car to units; missing person searches; lighting crime scene or emergency areas; rescue; fire detection; traffic enforcement; and riot control and ground search coordination
- (72) Using "quick call" systems (where dispatchers activate car horns) to alert officers outside of cars of other priority service needs.
- (73) Using supervising field sergeants as the first responding unit when back-up from regularly deployed field units is requested
- (74) Using low-cost and movable facilities when decentralized police sub-stations are needed
- (75) Using queuing theory in the allocation of field units to reduce to a low level or probability that a high-priority service call requiring the immediate dispatch of a vehicle will have to be placed in queue (or line) for more than a prescribed time period
- (76) Using search theory to compute the space-time coincidence of certain repressible crimes which can be observed and street surveillance coverage and the probability of these crimes being detected
- (77) Analyzing the degree to which and magnitude of certain crimes which are repressible and capable of being detected by field surveillance and using these data to determine patrol densities and frequencies by time, day and geographic area
- (78) Using psychological tests to screen out candidates for police officer positions who might have difficulty in handling the pressures and stress of a field police officer

EXHIBIT XV (6)

- (79) Increasing the number of traffic stop/warnings rather than traffic stop/citation as an alternative to achieving more traffic contacts within the field manpower time available
- (80) Using marked police sedans rather than solo motorcycles for traffic enforcement to increase the utilization of police vehicles (particularly if solo motorcycles are taken home by traffic officers at night).
- (81) Decreasing the number of overlapping shifts to reduce the number of patrol cars needed during peak workload periods
- (82) Retaining the 5/8 plan rather than instituting the 4/10 plan to avoid the need for additional field manpower to cover an additional day off as well as other normal time off requirements. (like vacations and holidays)
- (83) Restricting field policing units from proceeding to requested service calls unless they are specifically dispatched

- . The extent (quantified) to which it contributes to achievement of the objectives and performance measures established on a continuing rather than interim basis.
- . The complexity of operational changes needed to implement the alternative (including procedural modifications, service disruptions, and training requirements), and length of time required for implementation.
- . The degree to which the alternative improves the management and delivery of field policing services.
- . The extent to which the alternative reduces, controls or avoids costs.
- . The degree to which financial support for the alternative can be obtained.
- . The extent to which the alternative is feasible from an employee or community acceptance standpoint.

Considering these various benefit criteria, the contribution of each alternative toward accomplishing objectives and availability of financial support are considered the most important. Also, within a police department, the degree to which each alternative is accepted and supported by police officers and community groups requires careful consideration.

After each alternative has been evaluated against the six benefit criteria described above, they should be compared and ranked. An illustrative comparison table for a benefit analysis of alternatives for reducing dispatching delays is set forth below:

	Alternatives:			
	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>
Contribution to objectives as measured by:				
. Average dispatch time				(Quantified)
. Maximum dispatch time				
. % of time all incoming circuits busy				
Complexity of change				(Narrative)

Impact on police management and service	(Narrative)
Impact on employee/ community acceptance	(Narrative)
Cost Impact	(Quantified in next work step)
Financial support implications	(Narrative)

Even without sophisticated benefit data in quantitative form, the benefits of alternatives can be better assessed by analyzing their contribution to performance objectives and measures.

(2.6) Evaluating the costs of the alternatives identified

Each alternative considered in resolving a field policing problem usually has a cost impact. This cost impact might be to: (1) increase expenditure levels; (2) reduce costs; or (3) increase policing services within existing cost levels. In assessing the cost implications of alternatives, the following cost elements should be evaluated to determine the extent of possible expenditure increases or reductions:

- Field policing costs, primarily associated with manpower and equipment changes. These costs or savings include: (1) salaries and fringe benefits or personnel required to install and operate the alternative; (2) one-time capital outlays or continuing rental costs for equipment and facilities; and (3) other supporting costs like training and supplies.
- Other police department costs, primarily involving manpower and equipment changes in other organizational units within the department. The organizational units which may be sensitive, from a cost standpoint, to changes in field policing approaches and methods include investigations, communications, and records. For example, if it were determined that field police should completely follow-through on investigations involving certain types of crimes, this might increase the number of field personnel but decrease the number of detectives needed.

- Other city department or community costs involving cost changes in other city departments or the community serviced. For example: (1) if field police no longer monitor business licenses, another city department (like the city clerk) may need to increase manpower to conduct license inspections; or (2) if installation of a new device could help reduce the number of false silent alarms, businesses might be required to incur an additional equipment cost.

The proper costing of alternatives for meeting a field policing objective requires a complete understanding of how the alternative will operate or function. If, for example, an objective was established to reduce police officer time in transporting persons in custody and one alternative was to establish an overnight detention facility at the police headquarters, this alternative might be simply costed as follows:

	<u>Annualized \$ value of Benefit / (Cost) From:</u>
• Reducing officer time now spent in prisoner transport: 600 hours x \$6.00 per hour	\$3,600
• Reducing vehicle costs in prisoner transportation: 35,000 miles @ 10¢ per mile	3,500 <u>3,500</u>
	\$7,100
• Increasing facility costs through construction of a detention facility: \$88,000 capital cost ÷ 20-year useful life	(\$4,400)
• Food and lodging for persons in custody: 600 days @ \$3 per day	(\$1,800)
• 24 hour supervision of the facility: 5 jailers @ \$5,000	(25,000) <u>(25,000)</u>
	(\$31,200)

Gross \$ value of
benefit/(cost)

(\$24,000)

* * * * *

Exhibit XVI, following this page, presents a simple format for presenting and documenting analysis regarding the benefits and costs of alternative approaches for providing field policing services.

(3) Task responsibility

The responsibilities for analyzing the benefit and cost of alternative approaches for providing field policing should be assigned as follows:

Participant

Responsibility

City Council

Identifying potential field policing problems for possible benefit/cost analysis; reviewing the findings of alternatives analyzed and recommendations requiring additional funding.

City Manager

Identifying potential problems for benefit and cost analysis; approving a multi-year plan for analyzing alternative policing approaches and methods (with a minimum of one issue being evaluated each year); reviewing analytical findings; presenting recommendations to the city council which require additional financing.

EXHIBIT XVI

FORMAT FOR PRESENTING A BENEFIT
AND COST ANALYSIS IN FIELD POLICING

I. NATURE OF THE PROBLEM

- . Problem definition
- . Considerations which make the problem important
- . Current size of the problem (quantified) and groups affected
- . Possible causes of the problem
- . Future magnitude of the problem (quantified)

II. OBJECTIVES AND MEASUREMENT CRITERIA

- . Objectives (end results desired) to reduce problem
- . Measures (to determine if problem being reduced)

III. ALTERNATIVES CONSIDERED

- . Description of each alternative considered to solve the problem

IV. EVALUATION OF POSSIBLE BENEFITS OF EACH ALTERNATIVE

- . Criteria against which alternatives will be evaluated
- . Evaluation of benefits (quantified where possible)
- . Constraints of benefit analysis

V. EVALUATION OF POSSIBLE COSTS OF EACH ALTERNATIVE

- . One time and continuing costs
- . Unit costs of benefits (if possible to compute)

VI. POLITICAL AND OTHER SIGNIFICANT FACTORS

- . Factors or constraints which exist affecting the choice of alternatives

VII. RECOMMENDATIONS

- . Action (s) recommended
- . Further studies needed

Police Chief

Developing a multi-year plan for evaluating field policing alternatives; reviewing the findings of benefit-cost analysis; approving alternatives which do not require additional financing; informing the city manager of alternatives implemented which provide more service at existing cost levels or reduce costs; recommending alternatives needing additional funding.

Other Unit
Commanders and
Supervisors

Identifying field policing managerial and operations problems; participating in benefit-cost analysis; implementing approved recommendations.

Planning and
Research Unit

Coordinating the identification of field policing issues or problems and formulation of objectives; determining performance measures for objectives; identifying alternatives; evaluating benefits and costs of alternatives (assisted by budget unit); recommending the most desirable alternatives; training in-house project teams in benefit and cost analytical techniques.

(4) Considerations which affect decision-making in this work task

Analyzing the benefits and costs of alternative approaches and methods for providing field policing services may face several problems, including:

Resistance among some police personnel in having a systematic assessment conducted of the existing way field policing services are provided, particularly:
(1) how field time is and should be utilized; or (2) such traditional operating practices as two-man cars, conspicuous patrol, or large traffic units.

- . Difficulties in identifying innovative field policing approaches tried elsewhere to provide part of the foundation for benefit and cost analysis.
- . Difficulties in formulating valid measures for determining whether a field policing objective is being achieved (like an appropriate measure for determining acceptable backup levels).

III. ANALYSIS OF ALTERNATIVES FOR ATTAINING
RESPONSE TIME SERVICE LEVELS

III. ANALYSIS OF ALTERNATIVES FOR ATTAINING RESPONSE TIME SERVICE LEVELS

The purpose of this chapter is to analyze the benefit and cost of several possible alternatives in the Pasadena Police Department for achieving desired response time service levels for the field policing function. In addition, this analysis attempts to demonstrate the application and usefulness of the methodology set forth in Task 14 of the performance-cost decision-making system pertaining to disciplined benefit-cost analysis of various police service alternatives.

1. Nature Of The Problem

The response time of field policing units to calls for service represents a valid issue for benefit and cost analysis in the Pasadena Police Department since: (1) at least one major study has indicated that decreases in response time increase the probability of a police arrest; and (2) response time can be used as a quantifiable and meaningful measure of field policing service levels in the crime investigation and community service categories.

(1) A definition of response time and its components

Response time can be defined broadly as the time which elapses between the moment the need for police service is created to the moment an operational police unit arrives to handle this need. In practice, response time is composed of a series of five separate response components, as follows:

- . Detection time, or the time which elapses from when an action occurs which requires police attention to the detection of this need by the victim, another citizen, police or a sensor device. This would be the time, for example, from when a burglar enters a residence to the detection of this action by a neighbor or several days later by the family returning home. Detection time can be extremely short (like in a purse snatching) or long (like a forgery or fraud).
- . Reaction time, or the time which elapses from the moment a need for police service is detected to the moment an effort is made to contact the police. The reaction process consists of deciding that police help is needed and how they will be summoned.
- . Communications time, or the time which elapses from when an attempt is made to contact the police to the moment the message is received by the police organization. The communication process involves the various methods by which requests for police action are transmitted to the police.
- . Control center time, or the time which elapses from when the request for service is received by the police to the moment an operational police unit has been assigned responsibility to handle the service request. The control center process consists of receiving and understanding the service request, selecting and contacting a policing unit, and providing that unit with the necessary information.

- . Field response time, or the time which elapses from when a policing unit is given a call assignment to the arrival of the unit on-site to provide the service. The field response process consists of the possible lag between receipt of a dispatch and when travel begins, traveling by some motorized means, and traveling by foot to the dispatched location.

By defining response time in this manner, it becomes apparent that: (1) the actions of the field policing organization can have significant impact only upon certain response time components, primarily control center and field (or travel) response; (2) little data is available to provide a complete profile of the response time, by type of incident, which takes all components into account; (3) a variety of factors can affect the time which elapses in each response time component; and (4) police departments, in the future, will need to give increased attention to ways in which their impact on response time in the detection, reaction and communications components can be increased if a comprehensive approach to the response time issue is to be effected.

(2) Considerations which make response time potentially important as a measure of police service levels

Since the primary purpose of response time analysis is to determine how the field policing function can better serve the community through faster response to requests for service, it is important to define its potential benefits or objectives. Three overall benefits are identified, as follows:

Increasing the probability of apprehending alleged criminals

In 1966, a study was conducted, using sampled data from the Los Angeles Police Department, to identify and evaluate the impact of various elements of the apprehension process on the solution of crimes. In this analysis of about 1,900 reported crimes, it was concluded that: (1) the most significant factor affecting clearance of reported crimes was the naming of a suspect in the crime report (with 86% of the cases cleared involving a named suspect in the crime report compared with only 12% when no suspect was named); and (2) shorter response times are directly correlated with arrests (with about 62% of the cases ending in arrest when response time was one minute compared to 44% when all cases with response times averaged under 14 minutes.)

While there is some evidence that lower response times increase apprehension capabilities through arrest (either on-site by the responding officer or more accurate identification of the alleged offender), many questions continue to exist, including:

- If and how response time/apprehension probabilities vary by different types of crime classifications as well as the call status like emergency, urgent and non-emergency.
- If and how on-view apprehension by arrest could be increased by stakeouts or other crime repression tactics rather than field units responding quickly to a call.
- If and how suspect identification could be improved through different follow-up investigations techniques or citizen education on ways to improve suspect identification.
- If and how arrests made through more rapid call response actually lead to legal complaints and then conviction.

- If and how reduced response time/increased apprehension correlations may be related to various components in the response time process or factors not directly related to response times like the terrain of the crime scene.

Further experimentation will be required to provide better answers or insights to these questions.

Maintaining the community's feeling of security and safety

A second potential benefit or objective of response time is its possible contribution to the feeling or attitude within a community that citizens are relatively secure and safe. It can be hypothesized that citizen knowledge that requests for police aid will be promptly handled helps create a feeling of security within the community. In practice, several police departments now use as a service measure the number of "slow roll" complaints received, particularly in high wealth cities.

The validity of the hypothesized reduced response time/increased feeling of community security relationship is very difficult to ascertain. Also, if this relationship exists, it is extremely difficult to measure the degree to which average response time reductions (like from 15 to 10 minutes) would affect possible increases in the community's feeling of safety.

Even with these measurement and analytical limitations, this potential benefit of police response time needs to be considered, at least subjectively. In addition, attempts to measure this relationship might be considered through periodic crime audits, community attitude questionnaires, or structured town hall meetings which seek answers to such questions as:

- Do both requestors and non-requestors of police services feel response times are acceptable (graded, perhaps, as outstanding, average, inferior) and reasons why?

- Do these subjective evaluations of response time adequacy (expressed, perhaps, as a percentage of respondents selecting various grading categories) differ according to various types of service requests?
- Do subjective evaluations of response time adequacy differ among various geographical areas in the city?

Well designed community attitude survey instruments might shed light on these questions.

Reducing suffering or injury

A third potential benefit or objective of response time is reducing or avoiding the suffering or injury of the individual or group requesting police assistance. Rapid response times can be expected to reduce suffering or injury in certain types of crime (like a robbery) and community services (like a traffic accident with injury or a family dispute). Although the general validity of this objective appears defensible, several important questions exist, including:

- What types and how many incidents actually provide an opportunity for the field police to reduce suffering or injury?
- To what degree is suffering or injury avoided or reduced when response times are lowered?

Techniques for measuring reduced or avoided injury and suffering or the correlation between response time/injury and suffering levels are not readily available. However, this objective needs to be considered in response time analysis at least on a qualitative basis.

(3) Response time experience in the City of Pasadena

Response time data for the control center and field response components of the response time process were collected by analyzing almost 4,100 call slips for service requests during a four-week period. Exhibit XVII, following this page, presents control center and travel requirements, in minutes, for each type of crime or incident for which data were available. In reviewing these data, it should be noted that:

- . Control center response consists of the elapsed time from when a call was received until a field unit was specifically dispatched. Basically, this response activity consists of the complaint clerk answering the phone (or noting an alarm triggered), obtaining information on the nature and seriousness of the call, transmitting this information to a dispatcher, selecting a unit or units that can respond (depending on their location and in-service availability) and providing the responding unit with necessary call information. A detailed description and analysis of the control center activities in the Pasadena Police Department are set forth in Appendix F to this report.
- . Field response consists of the elapsed time from when an available unit was given a call assignment and its arrival to the location of the possible service need. This response activity consists of the possible lag between the time the field unit acknowledges acceptance of the call and when it actually rolls and vehicle travel to a specific location with arrival being acknowledged. It generally does not include foot travel after the field unit has arrived.

Analysis of these sample response time data, even in aggregate form, provides some parameters for both documenting and questioning the potential magnitude of the response time problem in Pasadena.

Tentative findings are as follows:

EXHIBIT XVII

City of Pasadena

RESPONSE TIMES FOR CONTROL CENTER AND FIELD UNIT
TRAVEL ACTIVITIES FOR A FOUR WEEK PERIOD

	<u>Number of Calls</u>	<u>Average Control Center Processing Time (minutes)</u>	<u>Average Field Travel Time</u>
I. CASE CLASSIFICATION			
Rape	3	-	-
Robbery	68	3.92	4.33
Aggravated Assault	48	8.16	6.40
Burglary	717	10.09	6.61
Theft	237	16.71	10.31
Auto Theft	<u>116</u>	<u>25.42</u>	<u>10.54</u>
SubTotal	<u>1,189</u>		
Other Assaults	72	32.17	9.35
Arson	5	-	-
Forgery & Counterfeiting	34	7.94	12.15
Fraud	7	-	-
Property	1	-	-
Vandalism	132	15.88	8.18
Weapons	14	-	-
Sex Offenses	8	-	-
Narcotic Drug Laws	24	4.64	7.57
Gambling	4	-	-
Offense-Family/Child	7	-	-
Driving under Influence	13	-	-
Liquor Laws	1	-	-
Drunkenness	76	7.38	5.29
Disorderly Conduct	807	12.69	8.67
All Other Offenses	190	10.99	7.40
Bombs & Explosives	2	-	-
Traffic Violations	732	32.57	14.15
Other Accidents	5	-	-
Juveniles	<u>24</u>	<u>14.41</u>	<u>12.38</u>
SubTotal	<u>2,158</u>		
Property - L & F	59	24.25	8.51
Persons - L & F	85	16.69	9.92
Casualty	68	5.35	8.57
Miscellaneous Public	461	10.31	10.52
Correspondence	-	-	-
Outside Assistance	44	11.21	8.03
Warrant Arrest	<u>21</u>	<u>23.67</u>	<u>4.56</u>
SubTotal	<u>738</u>		
Total	<u>4,085</u>	<u>16.26</u>	<u>9.74</u>

Note: Where no time data is presented, the sample was considered too small for a reasonable time estimate. Also, the large number of burglary calls include many silent alarms which were subsequently found to be false.

- The average control center and field travel response times for all types of cases approximates 26 minutes for service requests involving the dispatch of a field unit. Control center response (averaging about 16 minutes) was the predominant factor in delay compared to field travel time (averaging slightly less than 10 minutes). Response times for control center processing ranged from about 3 to 33 minutes for 20 different types of crimes or incidents and from 4 to 15 minutes for field unit travel. Since control center activities account for about 61% of the total response time delay by the department, possible factors causing this time requirement warrant further weighted analysis.
- The variations in response times for different types of cases reflect implicit dispatching and officer response priorities (like an average response time of 33 minutes for cases involving lost and found property compared with 8 minutes for robbery). The average control center and field travel response times for robbery (which averaged about 8 minutes) probably represents the lowest average response time limit for all types of calls.
- The data system in use at the time the response time sample was taken did not permit identification or analysis of the average response times for truly emergency calls (defined as an "in-progress" incident or one considered to require a fast response). Communication center personnel estimate about four calls a day or close to 3% of the requests for assistance involving dispatch actually are emergencies. This figure compares with about 17% of close to 4,400 sampled calls in another police department which were handled as emergency calls by dispatchers, many of which, however, were false burglar alarms. The absence of more definitive and reliable data on response times for truly emergency calls hampers analysis on the current adequacy of field policing response times.

- No data currently exists in Pasadena on the average or estimated time required for detection, reaction and communication to the police. These data limitations further restrict a comprehensive response time analysis.

(4) Factors which determine the extent of control center and field travel response delays

Further evaluation of the response time experience and process in Pasadena permitted identification of the various factors which determine the magnitude of control center and field travel delays.

Control center processing delays are affected by such factors

as:

- . The number of different processing steps in handling calls and the procedures used to transfer call information to various processing points.
- . The number of complaint clerks on duty and their individual skill and speed in processing incoming calls.
- . The policy of the department in screening calls before field units are dispatched and the manpower available to take reports by phone without interrupting the workflow of calls requiring a dispatch.
- . The number of dispatchers available compared with the volume of calls requiring dispatch and the time required to transmit essential call information to field units.
- . The volume of other information exchanges between dispatchers and field units and the time required for these different types of information exchanges.
- . The information processing capacities of the communications equipment and systems used for transmitting information among complaint clerks and dispatchers and dispatchers and field units as well as the volume of these activities compared to processing capacities.

. The availability of field units which are in-service and can immediately accept a service call. This critical response delay factor is further affected by:

- The number of units in the field which are detailed to handle calls for service (or call handling capacity) compared with the volume of calls to be handled (or call demand).
- The actual time required and spent to handle each case by type of call.
- The departmental policy regarding the dedication of various types of field units to handle or not handle various kinds of service requests.
- The policy of the department and actual field practices regarding number of field units which respond to a specific service request and whether lower priority calls or out-of-service time can be interrupted for a higher priority service request.
- The extent and justification of out-of-service time for field units in the field.
- The departmental policy regarding the number of one and two man units.
- The appropriateness of field manpower deployment in relation to actual or anticipated service request workloads by time of day.

. The amount of time required for dispatchers to find and select a field unit to respond to a service request.

. The perceptions which individual complaint clerks and dispatchers have regarding the relative priorities and importance of different types of service requests requiring the dispatch of a field unit as well as formal departmental policies regarding which types of calls are to be handled as emergencies and non-emergencies.

. Dispatching policies regarding which field units should be assigned to calls in terms of the geographical location of the service need and geographical assignment of potential responding units.

Field response travel delays are affected by such factors as:

- . The knowledge of dispatchers regarding where existing field units are actually located and their ability to detail the closest possible unit.
- . The geographical distance the field unit must travel from its initial location to the site of the service request.
- . The average speed at which the responding field unit can travel. This travel response factor is affected further by:
 - Departmental policies regarding how different types of calls can be responded to in terms of using red lights and siren and formal speed limit restrictions.
 - The familiarity of the responding officer with the actual location of the service request and the shortest way to get there.
 - Traffic congestion.
- . The officer's perception and motivation regarding the urgency and importance of the service call.
- . The time lag which actually occurs between the moment a field unit is dispatched and when it actually rolls on the call.
- . The availability of space for the responding vehicle to park once it arrives on the scene.
- . The distance and speed which the responding officer must travel on foot once the field unit has arrived at the location of the service need.

(5) Further dimensions of the response time situation in Pasadena

To determine further possible dimensions of the response time situation in Pasadena, estimated response time expectations for travel, service call processing, and delay caused by the unavailability of field units were evaluated. The findings of these three analyses are summarized, as follows:

Travel time expectations

Based on Pasadena being about a 25 square mile area, the average travel distance for a field unit, if dispatched from any location in the city and without knowledge of the unit's location, would be about 3.33 miles (which represents two-thirds of the side of a 5-mile by 5-mile square as determined by a theoretical travel distance model). Therefore, the average travel time for an emergency call, at an average speed of 35 mph, would be 5.7 minutes (3.33 miles \div 35 mph/60 minutes) and a non-emergency call would average 10 minutes, at an average speed of 20 mph (3.33 miles \div 20 mph/60 minutes).

If units are dispatched from any location in one of the four quadrants and without knowledge of the unit's location in the quadrant, the average travel distance would be about 1.67 miles (which represents two-thirds of a 2 1/2 by 2 1/2 mile square). Therefore, the average travel time for an emergency call would be 2.9 minutes and for a non-emergency call about 5 minutes.

If it's assumed that all non-emergency calls within a quadrant are handled by units assigned to that quadrant, but half of the emergency calls are handled by units from other quadrants (to minimize substantial dispatching delays due to unit unavailability), then the average travel time for emergency calls would be 4.3 minutes (3.33 miles \times .5 + 1.67 \times .5 = 2.5 miles \div 35 mph/60 minutes).

Using these assumptions, therefore, expected field unit travel time in Pasadena would average 4.3 minutes for emergency calls and about 5 minutes for non-emergency calls. Since the average field travel time in Pasadena averaged 10 minutes for the four-week sample period and most of these calls were non-emergencies, actual travel time appears to be about double (or five minutes more) than that to be expected given the size of the city, average travel speeds anticipated, and existing quadrant deployment and inter-quadrant dispatching patterns. Therefore, approaches should be explored for reducing average travel times from 10 minutes to 5 minutes.

Control center processing time expectations

A detailed analysis of control center processing activities was conducted for the two locations at which service requests are handled, the front desk in the police department building and the communications center in an adjacent facility, as set forth in Appendix F. Each of these control center points is comparably manned and equipped.

High priority emergency calls at either location are estimated to require about 25 to 30 seconds for processing (to answer the phone, determine the nature and importance of the call, notify the dispatcher or desk sergeant, and provide field units with key information) assuming: (1) other normal complaint processing steps are bypassed; and (2) a field unit available for dispatch can be immediately identified and contacted.

However, normal control center time requirements for service request processing are estimated as follows for the two locations.

Activity	Estimated Minimum Time Requirements At:		
	Front Desk	Communications Center (in seconds)	Another Large Police Department
Receive call and complete dispatch slip by complaint clerk	180	180	88
Place slip in tube carrier for transmittal to communications center	10	-	-
Movement of dispatch slip from front desk to communications center by pneumatic tube	40	-	-
Removal of slip from tube by dispatch clerk in communications center and placement on conveyor to dispatcher	10	-	-
Movement of dispatch slip to dispatcher	-	-	-
Select and assign call to available field unit	<u>15</u>	<u>15</u>	<u>17</u>
	<u>255</u>	<u>195</u>	<u>105</u>
Average time in minutes	<u>4.25</u>	<u>3.25</u>	<u>1.75</u>

From analysis of these estimated time data, it was concluded that for non-emergency calls: (1) control center processing requires at least three minutes if the call is received at the communications center and four minutes if the call is received at the front desk; (2) an additional minute is required to transmit complaint and dispatching information from the front desk to communications center if the front desk receives the call initially; and (3) the estimated time requirements for normal service request processing at the communications center are about 90 seconds longer than the work output standards established through detailed time studies for service call processing in another large municipal police department.

Dispatching delay due to unit unavailability expectations

The most often cited factor in control center processing delay is the unavailability of field units for immediate dispatch to service requests. To estimate this possible dispatching delay expectation in Pasadena, a classical queueing model was adopted and applied to compute probable delay times because of field units being tied up on other service calls. This model and approach for estimating dispatching delay are described in Appendix G.

Estimated dispatching delays due to field unit unavailability were based on: (1) the average demand for service (calls per hour) for eight different time periods in a typical day based on workload data for two months in 1971; (2) the average capacity available to handle this demand based on the number of field units effectively available by time of day through the team policing schedule (excluding police agents and other dedicated service units); (3) an average service time for case handling of .73 hours; (4) the average utilization of field units in handling service calls by time period; (5) a computed delay factor obtained from a standard queueing delay table; and (6) a computed average delay in minutes due to field unit unavailability.

These estimated dispatching delays were determined for three different types of dispatching policies: (1) where any field unit in the city could be dispatched regardless of the call location; (2) where the city was divided in half and units could respond to calls only in their half of the city; and (3) where the city was divided into quadrants and units could respond only to calls in their quadrant. Dispatching delay because of unit unavailability for these three types of dispatching policies were computed as follows:

	Average Dispatching Delay If:		
	Service Time <u>.73 hours per call</u>	Service Time <u>.80 hours per call</u> (in minutes)	Travel Average (non-emergency) time
<u>Case 1</u>			
Citywide deployment and dispatching	1.43	1.89	10.00
<u>Case 2</u>			
City divided in half for deployment and dispatching purposes	3.33	5.08	-
<u>Case 3</u>			
City divided in quadrants for deployment and dispatching purposes	12.48	17.72	5.00

Analysis of these estimated dispatching delay data suggests the following:

- Dispatching delay due to field unit unavailability is the dominant factor in the average control center processing time of 16 minutes since normal control center processing activities average only three to four minutes per call.
- Average dispatching delay is minimized when any unit in the city can be dispatched to a call (which generally is the case in an emergency situation). Correspondingly, dispatching delay increases dramatically as geographical restrictions are imposed on which units can be dispatched to meet a service need. This occurs even though the average workload utilization of field units is the same under each situation.
- When average dispatching delay due to unit unavailability and travel time are considered together under Case 1 and 3 for non-emergency calls, Case 3 causes more of a total response time delay problem even though average travel time is 50% less.
- A 10% increase in average case handling time (like from .73 to .80 hours per case) can increase average dispatching delay time from 30% to 50% depending on the deployment and dispatching policies used. As a result, dispatching delay is extremely sensitive to relatively small changes in average case handling time and officer time utilization.

(6) The potential magnitude of the response time situation in Pasadena in the future

In considering the forecasted call for service caseload for calendar year 1972 to be handled by field units in Pasadena, the following estimates were made regarding the potential magnitude of the response time issue. Average estimated dispatching delays for the three dispatching policies compared with calendar year 1971 levels are as follows:

	<u>Average Dispatching Delay if Service Time Per Call Is:</u>			
	<u>.73 Hours</u>		<u>.80 Hours</u>	
	<u>1971</u>	<u>1972</u>	<u>1971</u>	<u>1972</u>
	(in minutes)			
<u>Case 1</u>				
Citywide deployment and dispatching	1.43	4.13	1.89	4.87
<u>Case 2</u>				
City divided in half for deployment and dispatching	3.33	7.72	5.08	10.60
<u>Case 3</u>				
City divided in quadrants for deployment and dispatching	12.48	23.29	17.73	46.96

As noted in these estimates, estimated dispatching delays because of the unavailability of field units could double if alternatives are not analyzed to improve response times.

2. Objectives and Measurement Criteria

Given the previous analysis of the response time situation in Pasadena and the estimated magnitude of response time components which the police department can exercise most control over, a number of response time objectives can be established. Three near-term objectives and measurement criteria are summarized below:

<u>Near-Term Objectives</u>	<u>Measurement Criteria</u>
• Reduce the average dispatching delay due to the unavailability of field units for quick dispatch	Average actual dispatching delay for calls for service due to unit unavailability
• Reduce the response time for field unit travel from the time of dispatch to the time of arrival	Degree to which average travel times approach five minutes
• Reduce average control center processing activities per call	Degree to which average control center processing activities approach two minutes or another engineered work output standard for complaint handling and dispatching work per call

Several longer-range response time objectives are set forth as follows:

<u>Long-Range Objectives</u>	<u>Measurement Criteria</u>
• Determine the nature and magnitude of police response times for emergency calls	Number of emergency calls, by type of crime or incident, which have control center and travel response times of less than one minute, from 1.00 to 1.99 minutes, 2.00 to 2.99 minutes, 3.00 to 3.99 minutes, 4.00 to 4.99 minutes, and 5 minutes and above; number and correlation of arrests or other injury reduction factors with response time levels by type of emergency call
• Reduce average control center and travel response times to emergency calls for service	Degree to which control center and travel response times for emergency calls approach three minutes or less

Long-Range Objectives

Measurement Criteria

- Determine the nature and magnitude of the time required for individuals to react to and communicate with the police for emergency and non-emergency calls
- Determine the possible nature and magnitude of detection time by type of crime or incident

Estimates of the time needed to react and contact the police by type of service request as determined by crime audits and questionnaires to a sample of persons who have contacted the police for service

Estimates of the time required to detect a need for police service, by type of need, as determined by crime audits, questionnaires to service requestors, interviews with detectives and persons convicted of criminal acts, and analysis of crime reports.

3. Alternatives Considered

A wide range of alternatives is possible for reducing field policing response times depending on the response time component being considered. For the purpose of this illustrative benefit and cost analysis, five alternatives were considered for reducing average travel, control center processing activities, and dispatching delays due to unavailable units. These alternatives are briefly described below:

• Alternative 1 - Monitoring the actual and average response times of individual units and officers for emergency and non-emergency calls

Under this alternative, the Pasadena Police Department would adapt their new information system to: (1) provide regular data on the average travel time response of individual officers from time of dispatch to arrival at the scene; and (2) provide current information on the location of emergency and non-emergency calls so that deployment of field units by watch commanders could be done on the basis of equalized call activity areas. The purpose of this alternative would be to: (1) let individual officers know their travel time response performance would be continually monitored in relation to other officers. (This, hopefully, would reduce lag time because of informal priority and individual attaches

to a call as well as induce the element of competition in call response.); (2) by regularly identifying the recent location of calls by geographical areas so that cars could be deployed on the basis of an estimated and equalized call activity basis. (This, hopefully, would place cars closer to call locations.); and (3) if travel time and, therefore, case handling time could be reduced, increase the probability that more units would be available for dispatch to reduce potential dispatching delays due to unit unavailability.

. Alternative 2 - Adding two more field units to each of two teams normally scheduled

Under this alternative, two field units (each working 10 hours) would be added to each of two teams normally scheduled for field duty. These four units would be added during time periods when the highest dispatching delay was anticipated using forecasted called for service levels by time periods for calendar year 1972. These units would be added to teams which are not scheduled to overlap so that patrol car requirements are not unnecessarily increased. These four units would provide an additional 40 gross hours of call receipt capacity each day or 36 net hours, after out of service time for briefing and eating are considered. The purpose of this alternative would be to reduce estimated dispatching delays during heavy call request periods because of field units being unavailable.

. Alternative 3 - Changing dispatching policies so that any field unit in either the north or south half of the city could be dispatched to a call in that area

Under this alternative, dispatching policies would be altered so that any unit in the north or southern half of the city could be dispatched to a call (emergency or non-emergency) rather than just to calls in the quadrant to which they are normally assigned.

The purpose of this alternative is to reduce anticipated dispatching delays due to unit unavailability which increase significantly when fewer units are potentially available to handle calls because of a specific quadrant assignment. It should be noted, however, that this greater dispatching flexibility and potential reductions in dispatching delay may be offset, in part, by increased travel response times since field units, if deployed randomly, may have to travel further to the site of a service request.

. Alternative 4 - Establishing work output standards based on time studies for complaint clerks in the control center process

Under this alternative, the call processing activities of complaint clerks would be measured to see if, through methods improvements and establishment of work output standards, the complaint processing time per call could be reduced.

. Alternative 5 - Instituting a combination of the possible changes suggested for the four previous alternatives

Under this alternative, an attempt would be made to see if several of the previous alternatives could be combined to reduce estimated travel and control center processing times at the lowest possible cost.

In considering these five alternatives, it should be emphasized that a large number of other alternatives for reducing control center and travel response times also could be evaluated. These other possible alternatives are suggested by the factors listed in the first section of this chapter which help determine the extent of control center and field travel response delays.

4. Evaluation of the Potential Benefits of Response Time Reduction Alternatives

The relative benefits of each of the five alternatives for reducing control center or travel response times, as discussed in the previous section, are evaluated against a specific set of criteria. These criteria and estimated benefits, which are quantified where possible, are set forth in Exhibit XVIII, following this page. In assessing the benefits of these various alternatives, several qualifications and explanations should be noted:

<u>Benefit Criteria</u>	<u>Alternative 1 Monitor Response Times</u>	<u>Alternative 2 Add Four Units (40 hours)</u>
(1) <u>Contribution to objectives as measured by average:</u>		
. Reduction in control center processing (minutes)	None	None
. Reduction in expected dispatching delay (minutes)	(3.0 to 26.0)	(16.0)
. Reduction in travel (minutes)	<u>(5.0)</u>	<u>None</u>
. Total response reduction (minutes)	<u>(8.0 to 31.0)</u>	<u>(16.0)</u>
. Reduction in control center response for emergencies	Not determined	Not determined
. Reduction in field travel response for emergencies	Not determined	Not determined
(2) <u>Complexity of change</u>	More accurate response time data needed on dispatch slips; new computer program needed and regular response time reporting by officer; need call location data displayed on map by grid; need training for command personnel on how to use locational data in deployment; need weekly or daily call load balancing to unit availability by time of day	Need to recruit 10 new officers and purchase 2 new vehicles; need to add units on team with heaviest call workload; need to arrange academy training for recruits and coach-pupil orientation; may strain supervisory span of sergeants on two teams to which units are added
(3) <u>Impact on police management and service</u>	Command personnel will spend more time on call demand/service capacity analysis; periodic audits will be needed to validate travel response data; citizen should feel impact of faster response (need to check before and after by crime audits)	Citizen should feel impact of faster responses; no real impact on police management; actual citizen impact will be needed to be measured through audits
(4) <u>Impact on employee/community acceptance</u>	Police officers may, at first, react negatively to being monitored on response times and deployment; positive citizen acceptance	Positive citizen acceptance, except, perhaps, for additional costs

EXHIBIT XVIII

City of Pasadena

ESTIMATED BENEFITS OF SELECTED ALTERNATIVES FOR REDUCING
CONTROL CENTER AND TRAVEL RESPONSE TIME

Alternative 3 Change Dispatching Policies	Alternative 4 Establish Work Outputs	Alternative 5 Combination of 1, 3, and 4
None	(1.5)	(1.5)
(16.0)	None	(16.0)
<u>2.0</u>	<u>None</u>	<u>(3.0)</u>
<u>(14.0)</u>	<u>(1.5)</u>	<u>(20.5)</u>
Not determined	Not determined	Not determined
Not determined	Not determined	Not determined
Need to dispatch and deploy on half-city versus quadrant basis on all watches; need training for dispatchers and possible changes in status board procedures; need to educate officers on quadrant they may not be familiar with	Need to conduct time studies of complaint clerks and method improvement analysis; need to obtain work measurement capability on permanent or contractual basis; need to sell work measurement program; need to periodically update standards; need to establish control reporting procedures	Same as complexities described in Alternatives 1, 3 and 4
Citizen should feel impact of faster response times but audits required; supervision of the dispatching process will require strengthening; departmental policies on dispatching will require review; patrol team assignment to specific quadrants will need to be modified	Citizen will not feel impact of slightly reduced response times; supervision of complaint clerk work outputs will require strengthening	Same as impact in Alternatives 1, 3 and 4 except impact on citizen should be significant
Positive citizen acceptance; team sergeants may feel team concept being eroded	Little citizen reaction expected; complaint clerks, initially, may feel overly monitored	Same as impact in Alternatives 1, 3 and 4

. The contribution of each alternative to achieving various response time objectives has been quantified in terms of "estimated minutes of response reduced." These are estimates based on: (1) analysis of control center processing steps and estimated time expenditures for each activity; (2) development and use of an expected travel time model based on Pasadena's size and average speeds anticipated; (3) application of a classical queueing model to estimate average dispatching delay times due to unit unavailability using the team schedule in use in 1971 and forecasted calls by time period in both 1971 and 1972... under three different dispatching policies; (4) field observations of field units in action and selected work measurement; (5) comparison of Pasadena's control center processing activities with work output standards developed for another large police department; and (6) use of response time findings in other recent research, including those for the Edina Police Department in Minnesota.

. The estimate of "minutes of response time reduced" for each alternative pertains, primarily, to expected response time levels if the forecasted and average service call demand for calendar year 1972 was achieved, particularly as related to dispatching delays caused by unit unavailability. These estimates of response time reductions are not linear. As response time reduction alternatives are attempted, the reduction of average response time will not follow a linear relationship.

. The limited data base in the Pasadena Police Department at the time of the response time study significantly restricted the types of analysis which could be conducted and produced an error factor in the response time data utilized.

. The only way to validate the accuracy of estimated benefits of alternatives presented, as quantified in this study, is to test them in field demonstrations.

The Pasadena Police Department, like most other medium-sized departments, has been limited in the types of operational data collected and maintained which is useful in benefit and cost analysis. In addition, due to operational considerations, it will remain limited in the amount of resources and time which can be devoted to benefit and cost analysis of various service alternatives. Therefore, the benefit and cost analysis is presented and has the same constraints which will be found and remain in most other police departments, at least for the next several years.

5. Evaluation of the Potential Costs of Response Time Reduction Alternatives

The estimated costs of each response time reduction alternative are summarized below for the first and second years of implementation. It should be noted that first year costs include possible startup or one-time expenditures.

Alternative 1 - Monitor response time

Additional costs in Year 1 could approximate \$10,000 for detailed information systems design, input/output document development, programming and testing. Second year costs could approximate \$5,000 for on-going computer time, supplies, input validation and other contingencies. Average annual costs for the two-year period could be about \$7,500 or a maximum of \$938 for each average minute of response delay reduced (assuming the minimum of only 8 minutes in response time reduction).

Alternative 2 - Add four field units

Additional costs in Year 1 could approximate \$196,900 for: (1) salary and fringe benefit cost of 10 officers (10 officers x \$11,616 + .185% in cash fringe benefits = \$137,649); (2) annual vehicle rental costs for two marked cars (2 x \$4,620 = \$9,240); and (3) estimated training costs of \$5,000 per man (10 x \$5,000 = \$50,000). For Year 2, annual costs would be reduced to \$146,900 (assuming no salary increase). Average annual costs for the two-year period could be about \$171,900 or a maximum of \$10,744 for each average minute of response delay reduced (assuming a maximum 16 minute reduction). It should be noted that four additional units would provide a potential benefit by increasing the gross patrol time available.

Alternative 3 - Change dispatching policies

Changes in dispatching policies should incur relatively minor cost increases in both Years 1 and 2. A contingency factor of \$3,000 in additional costs has been added to accommodate unanticipated expenditure increases. Therefore, average annual costs for the two year period could approximate \$3,000, or a maximum of \$214 for each average minute of response delay reduced (assuming a maximum 14 minute reduction).

Alternative 4 - Establish work outputs

Additional costs in Year 1 could approximate \$4,000 for analytical time to engage in methods and work measurement studies for complaint clerks and implement the work planning and control system. Second year costs could approximate \$1,000 for periodic work output standards update and reporting forms and supplies. Average annual costs for the two year period could be about \$2,500, or a maximum of \$1,667 for each average minute of response delay reduced (assuming a maximum of 1.5 minutes in response time reduction).

Alternative 5 - Combination of Alternatives 1, 3, and 4

Additional costs in Year 1 could approximate \$17,000 and \$9,000 in Year 2. Average annual costs for the two year period could approximate \$13,000, or a maximum of \$634 for each average minute of response delay reduced (assuming a maximum 20.5 minute reduction).

The estimated unit costs of these various response time reduction alternatives, when arrayed, are as follows:

	<u>Estimated Annualized Costs for Each Average Minute of Response Delay Reduced</u>
Alternative 3	\$214
Alternative 5	634
Alternative 1	938
Alternative 4	1,667
Alternative 2	10,744

6. Political and Other Significant Factors

No political or other significant constraints appear to exist in Pasadena to influence the choice of any response time reduction alternative explored.

7. Recommendations

In terms of estimated costs and benefits, either Alternative 3 (changing dispatching policies) or Alternative 5 (a combination of Alternatives 1, 3, and 4) appear acceptable given the analytical constraints of this specific benefit and cost analysis.

Further studies are needed to determine:

- . The degree to which dispatching delay due to field unit unavailability is actually reduced when dispatching policies are changed to a half-city orientation rather than a quadrant emphasis.
- . The extent of potential response time delays in the communications, reaction and detection components of the response time process.

IV. ILLUSTRATIVE APPLICATION OF THE PERFORMANCE-
COST DECISION-MAKING SYSTEM IN TWO CITIES

IV. ILLUSTRATIVE APPLICATION OF THE PERFORMANCE-COST DECISION-MAKING SYSTEM IN TWO CITIES

This chapter of the report presents a demonstration of how the performance-cost decision-making system can be used in determining police service levels and resource requirements in two city governments: the City of Pasadena (an independent city); and City of Commerce (a contract city). The application of this decision-making system to these two cities is illustrative in nature and presented in summary form since current knowledge and data gaps prevent a more exhaustive and definitive treatment of the various decision-making factors and methodologies set forth in the previous chapter.

In applying the performance-cost decision-making system to the cities of Pasadena and Commerce, a number of assumptions were made by the consulting team, particularly regarding possible police service level objectives and areas where further benefit-cost analysis might prove beneficial. These assumptions do not necessarily reflect the opinions of police and city officials in these two city governments.

1. The City of Pasadena, California

The performance-cost decision-making system for the field policing function appears to be fully applicable in the City of Pasadena. Therefore, the basic logic flow of this system has been tested in forecasting potential service levels and resource needs for fiscal year 1972-1973. Those determinations apply to the Uniform Division where field policing services basically are performed.

(1) Forecast of community generated caseloads

Projections of community generated caseloads for fiscal year 1972-1973 for incidents of a criminal nature and other community service requests are as follows:

- . Overall caseloads are forecasted to reach the 78,300 level, a 23% increase in cases over the previous year.
- . It is estimated that this caseload level will consist of:
 - Part I Cases 15,700
 - Part II and III cases and other community service incidents 57,800
 - Traffic accidents investigated 4,800
 - 78,300

Of the 78,300 cases expected to be handled by the Pasadena Police Department, 5,200 (or 6.6%) probably will continue to be generated through the initiative of police units (as contrasted with responding to a called for service). As a result, an estimated 73,100 cases will be truly community generated or called for services.

Assuming the distribution of community generated caseloads and associated work requirements (like report writing and arrests) among various kinds of handling units will not change appreciably from the previous year, projected workload volumes by activity are estimated to be as follows:

<u>Handling Unit</u>	<u>Forecasted Activities</u>		
	<u>Cases Handled</u>	<u>Reports Written</u>	<u>Arrests and Bookings</u>
Team policemen	60,900	29,200	2,550
Uniform agents	3,500	2,700	200
Selective enforcement team	800	400	200
Motor units	200	100	50
Complaint desk	<u>7,000</u>	<u>--</u>	<u>--</u>
	72,400	32,400	3,000
Detective and other non-field policing units	<u>700</u>	<u>300</u>	<u>2,200</u>
	<u>73,100</u>	<u>32,700</u>	<u>5,200</u>

Projections have also been made regarding the caseloads which will require backup, or two or more units for handling. These estimates are based on a backup requirement on 30% of the cases handled and are calculated, as follows:

. Estimated caseload for called for services and "on-view" actions	78,300
. Less: cases handled by the complaint desk	(7,000)
	<hr/>
	71,300
. A backup requirement (at least two men to handle) for 30% of the cases	x .30
	<hr/>
. Cases requiring backup	21,390
. Less: 35% of the estimated backup requirements due to the availability of two man cars (21,390 x .35)	(7,490)
	<hr/>
. Net estimated cases requiring backup	<u>13,900</u>
. Estimated number of cases requiring	
- Two units (80%)	11,100
- Three units (15%)	2,100
- Four units (5%)	<u>700</u>
	<u>13,900</u>

In the forecast of community generated caseloads, existing data limitations prevent detailed benefit and cost analysis in the following areas:

- . Identification of the types and volumes of various Part II and III offenses and other community service requests handled. Without these data, the number and types of lower priority service requests cannot be determined. As a result, the feasibility of using less expensive personnel in handling these work activities cannot be evaluated.
- . Identification of actual and necessary backup requirements. Without these data, detailed analysis of the justification of current backup levels and workload requirements cannot be determined.
- . Identification of the magnitude of potential problems caused by a large volume of false burglary alarms. Without these data, the evaluation of alternative ways of reducing this possible problem cannot be conducted.

(2) Establishment of tentative service level objectives and measurement criteria

Establishing, testing the validity, and refining service level objectives for the field policing function will be a continuing task of the Pasadena Police Department and city officials. As indicated in the previous chapter, a wide range of objectives and measurement criteria are possible. However, the applicability and validity of these various objectives can only be tested through an on-going program of evaluation, including monitoring the research results in other police departments.

For the purposes of this illustrative use of the performance-cost decision-making system, the service level objectives of the Pasadena Police Department have been tentatively established, by the consulting team to be as follows:

. Crime investigation

Reduce the average response time for all called for services involving criminal offenses by at least 25% during the next fiscal year (with the current average response time being 26 minutes).

Maintain an average response time for emergency calls involving potential criminal offenses of three minutes or less.

Maintain one field post 24 hours per day and two posts during the second and third watch to permit specialized crime scene analysis as required.

. Community service

Same objectives as those for crime investigation except for the crime scene analysis capability.

. Crime repression

Maintain a minimum of 30% of available street time of team policemen for officer initiated and programmed crime repression activities.

Maintain a minimum of 90% of available street time of the selective enforcement team for officer initiated and programmed crime repression activities.

. Traffic control

Maintain a minimum of 5% of available street time of team policemen for traffic control.

Maintain a specialized capability for selective traffic enforcement during the second watch, seven days a week.

. Field operations support

Maintain an aerial surveillance and backup to field units capability two watches each day.

Provide backup response capabilities among field policing units for 30% of the called for services handled.

Provide for an average of five days of in-service training for each sworn officer in the field, excluding briefing sessions.

Maintain a ratio of one supervising field sergeant to nine field units.

Maintain a "street time" availability of at least 85% of scheduled on-duty time.

These possible service level objectives as well as others which could be established are candidates for in-depth benefit and cost analysis concerning their continued justification and use.

(3) Forecast of the volume of officer initiated workloads

The Pasadena Police Department currently has only limited information on how field units currently utilize their non-called for service time. Statistics which relate to officer initiated workloads are restricted primarily to parking and traffic citations issued and descriptions of the activities of the helicopter unit and, to a lesser extent, the selective enforcement team.

Therefore, detailed forecasts of the desired volume of officer initiated workloads have not been made in this illustrative use of the performance-cost decision-making system. Instead, officer initiated workloads have been projected in terms of the percentage of time desired for crime repression and traffic control functions as set forth in the previous description of tentative service level objectives.

(4) Measures of the average time required for each workload activity

The average man hours spent in handling selected field policing workload units, as set forth in Chapter II, have been used in this illustrative example of the application of the performance-cost decision-making system in Pasadena.

(5) Determination of the man hours required by type of field unit to handle projected workload volumes

The estimated number of man hours needed by type of field unit to handle community generated and officer initiated workloads as well as achieve tentative service level objectives are set forth in Exhibit XIX, following this page. As noted in this analysis, the projected man hours are as follows:

Other Desired Time Uses	Forecasted		
	Team Policemen	Uniform Agents	Sel Enfor Te
• Maintaining 1 and 2/3 field posts for crime scene analysis daily		14,599	
• Maintaining 30% of street time for crime repression	34,963		
• Maintaining 90% of street time for crime repression			10,
• Maintaining 5% of street time for traffic control	5,827		
• Maintaining two field posts for selective traffic enforcement the second watch each day			
• Maintaining an aerial post for surveillance and backup to field units two watches each day			
Total Other Desired Time	<u>40,790</u>	<u>14,599</u>	<u>10,</u>
Total Forecasted Time	<u>116,544</u>	<u>22,881</u>	<u>11,</u>

EXHIBIT XIX (2)

casted Manhours Needed B :

Selective Enforcement Team	Motor Units	Helicopter Unit	Complaint Desk	Field Sergeants	Comments
10,593					
	5,840				
		11,680			
<u>10,593</u>	<u>5,840</u>	<u>11,680</u>			
<u>11,770</u>	<u>6,126</u>	<u>11,680</u>			

Workload Units	Projected Volume	Man Hours Per Unit	Gross Manhours	Forecasted Manhours			
				Team Policemen	Uniform Agents	Selective Enforcement Team	Mo Uni
<u>Called for services</u>	<u>72,400</u>						
- Team policemen	60,900	.53		32,277			
- Agents	3,500	1.00			3,500		
- SET	800	.53				424	
- Motors	200	.53					106
- Desk	7,000	--					
<u>Reports Written</u>	<u>32,400</u>						
- Team policemen	29,200	.33		9,636			
- Agents	2,700	.75			2,025		
- SET	400	.33				132	
- Motors	100	.33					33
<u>Arrests</u>	<u>3,000</u>						
- Team policement	2,550	1.00		2,550			
- Agents	200	1.00			200		
- SET	200	1.00				200	
- Motors	50	1.00					50
SubTotal				<u>44,463</u>	<u>5,725</u>	<u>756</u>	<u>189</u>
<u>Backup</u>	<u>13,900</u>		<u>16,589</u>	<u>14,266</u>	<u>2,323</u>	--	--
- Two units	11,100	1.06	11,766				
- Three units	2,100	1.59	3,339				
- Four units	700	2.12	1,484				
- Arrests	<u>1,950</u>	<u>1.00</u>	<u>1,950</u>	<u>1,463</u>	<u>234</u>	<u>156</u>	<u>97</u>
SubTotal				<u>15,729</u>	<u>2,557</u>	<u>156</u>	<u>97</u>
<u>Two Man Units</u>				<u>15,562</u>	--	<u>265</u>	--
<u>Estimated Called for Service Time</u>				<u>75,754</u>	<u>8,282</u>	<u>1,177</u>	<u>286</u>

EXHIBIT XIX

City of Pasadena

ESTIMATED FIELD POLICING MANHOURS REQUIRED TO HANDLE PROJECTED WORKLOADS AND
ACHIEVE SERVICE LEVEL OBJECTIVES

Manhours Needed By:

<u>Motor Units</u>	<u>Helicopter Unit</u>	<u>Complaint Desk</u>	<u>Field Sergeants</u>	<u>Comments</u>
106	--	--	--	
33	--	--	--	
50	--	--	--	
<u>189</u>				
--	--	--	--	Allocated on the basis of men in 1971-1972 committed to these units, or 86% for team policemen and 14% for agents
<u>97</u>	--	--	--	Allocated on the basis of manpower in 1971-1972 assigned to these units, or 75%, 12%, 8%, and 5%, respectively
<u>97</u>				
--	--	--	--	Based on 35% of field units being two-man cars and this percentage times the estimated called for services, reports, and arrests workload
<u>286</u>				

<u>Handling Unit</u>	<u>Established Manhours Required For:</u>		
	<u>Called for Services</u>	<u>Other</u>	<u>Total</u>
Team policemen	75,754	40,790	116,544
Uniform agents	8,282	14,599	22,881
SET	1,177	10,593	11,770
Motor Units	286	5,840	6,126
Helicopter	--	11,680	11,680
	<u>85,499</u>	<u>83,502</u>	<u>169,001</u>

(6) Determination of manpower availability for each type of personnel

The estimated manpower availability for each type of sworn personnel in the field policing function is projected as follows:

<u>Time Factor</u>	<u>Manhours Per:</u>		
	<u>Policemen</u>	<u>Police Agent</u>	<u>Sergeant</u>
. <u>Gross man hours</u>	<u>2,080</u>	<u>2,080</u>	<u>2,080</u>
. <u>Less time lost due to:</u>			
- Holidays	Paid	Paid	Paid
- Vacations	(97.6)	(140.0)	(144.0)
- Sick Leave	(49.6)	(49.6)	(49.6)
- Injury leave	(19.2)	--	--
- Attrition and academy training	(87.2)	--	--
- Leave of absence	(29.6)	(29.6)	--
- In-service training	(40.0)	(40.0)	(40.0)
- Court time	Usually paid	Usually paid	Usually paid
	<u>(323.2)</u>	<u>(259.2)</u>	<u>(233.6)</u>
. Total potential duty hours	1,757	1,821	1,846
. Less 15% allowance for non-operational duty time	(264)	(273)	(277)
. Net "street time" available per man	<u>1,493</u>	<u>1,548</u>	<u>1,569</u>

(7) Determination of the number and type of field personnel required to handle forecasted field workloads

The estimated number and type of field personnel required during fiscal year 1972-1973 in Pasadena to achieve service level objectives and handle workloads are summarized below:

<u>Handling Unit</u>	<u>Policemen</u>	<u>Uniform Agents</u>	<u>Sergeants</u>	<u>Lieutenants</u>	<u>Other</u>	<u>Total</u>
Team Policemen . 116,544 man hours ÷ 1,493	78.1	-	-	-	FAP*	78
Team Agents . 22,881 ÷ 1,548	-	14.8	-	-	FAP*	15
Team Sergeants . 94 policemen and agents ÷ 9 (one sergeant to nine officers)	-	-	10.3	-	-	10
Selective Enforce- ment Team . 11,770 ÷ 1,500	5.8	1.0	1.0	-	-	8
Traffic Units . 6,126 ÷ 1,493	4.1	-	-	-	-	4
Helicopter Unit . 11,680 ÷ 1,500	<u>5.8</u>	<u>1.0</u>	<u>-</u>	<u>1.0</u>	<u>-</u>	<u>8</u>
TOTAL	<u>93.8</u>	<u>16.8</u>	<u>11.3</u>	<u>1.0</u>	<u>FAP*</u>	<u>123</u>

*FAP = "Further analysis possible" in evaluating the use of other manpower types and skills to handle some of the functions and workloads of these units.

Other sworn and civilian personnel in the Uniform Division which may be needed to support field personnel in the performance of the field policing function are summarized as follows:

<u>Handling Unit</u>	<u>Policemen</u>	<u>Uniform Agents</u>	<u>Sergeants</u>	<u>Lieutenants</u>	<u>Other</u>	<u>Total</u>
Parking Control	-	-	-	-	5 FAP	5
Warrant Detail	2	-	-	-	1 FAP	3
Patrol Services Section	-	1	-	1	3 FAP	5
Complaint Desk	2	-	4	-	9 FAP	15
Dispatchers	2	-	-	-	FAP	2
Watch Commanders	-	-	-	4	-	4
TOTAL	<u>6</u>	<u>1</u>	<u>4</u>	<u>5</u>	<u>18</u>	<u>34</u>

It should be noted that these possible staffing requirements have not been subjected to service levels and workload analysis as were field policing personnel. These staffing levels, therefore, reflect primarily the personnel complement which was available to the Pasadena Police Department in February, 1972. The captain in charge of the Uniform Division and his secretary are not included in this staffing complement.

A comparison of projected 1972-1973 field policing staffing requirements with those available in February, 1972 is presented below:

<u>Types of Field Policing Personnel</u>	<u>Available February 1972</u>	<u>Projected For 1972-1973</u>	<u>Increase/ (Decrease)</u>
<u>Operational Field Units:</u>			
. Team Policemen	70	78	8
. Team Agents	11	15	4
. Team Sergeants	10	10	-
. SET	8	8	-
. Traffic Units	5	4	(1)
. Helicopter Unit	8	8	-
	<u>112</u>	<u>123</u>	<u>11</u>
<u>Other Uniform Division Units:</u>	<u>34</u>	<u>34</u>	<u>-</u>
TOTAL	<u>146</u>	<u>157</u>	<u>11</u>

Therefore, an additional 11 sworn personnel are warranted during fiscal year 1972-1973 for operational field units given the forecasted workloads and service level objectives previously established.

(8) Determination of the costs of the field policing function

In Pasadena, the projected costs of the field policing function will consist of the expenditures anticipated for the Uniform Division (where most field policing activities take place) and the selective enforcement team which is considered part of the Administrative Division from an organizational standpoint.

In Pasadena, expenditures for the Police Department are summarized by character (like personal services, non-personal services and capital outlay) and major objectives within each character (like rentals and office supplies in the non-personal services category). Certain expenditure categories, particularly those associated with fringe benefits (like retirement, health insurance and social security) and data processing are not included in the police budget. In addition, proposed and actual expenditures for the Police Department are not accounted for by major organizational divisions or programs (like administration, investigation, staff services, general services and field policing) or the organizational sections or sub-programs within these divisions.

To determine the direct costs of the field policing function (Uniform Division and selective enforcement team) for projected resource requirements needed to achieve tentative 1972-1973 service level objectives, the following costing approach was utilized:

The line item budget of the Pasadena Police Department for fiscal year 1971-1972 was converted to a modified program budget by first identifying the various organizational units through which services were provided.

- . The budgeted expenditures for organizational units were estimated, primarily by using the costing methodology set forth in the Phase I report. This methodology includes: (1) determining compensation costs for the number and type of personnel assigned to the unit, including cash fringe benefits; and (2) calculating non-personnel and capital outlay expenses for each organizational unit, based either on clearly identifiable usage or distributed on the basis of the percentage of total departmental compensation costs generated by that organizational unit.
- . The estimated organizational costs of the Uniform Division and special enforcement team were added together to obtain the full direct costs of the field policing function for fiscal year 1971-1972.
- . The increase (or decrease) in projected resource requirements (manpower, equipment, facilities, other support costs) for fiscal year 1972-1973 over those budgeted in 1971-1972 were identified for the field policing function (Uniform Division and special enforcement team).
- . These increased (or decreased) resource requirements were costed out separately by: (1) multiplying the number and type of manpower by compensation costs; (2) multiplying the number and type of equipment by annual rental costs; (3) determining the annualized costs of additional facilities, if any; and (4) determining other additional support costs, if any.
- . The incremental costs of increased (or decreased) resource requirements were added to or subtracted from the budgeted 1971-1972 expenditures for the field policing function in Pasadena.
- . The projected direct costs of the field policing function for fiscal year 1972-1973 were adjusted further by anticipated changes in salary levels and prices for commodities.

The gross forecasted direct costs of the field policing function for 1972-1973 were compared with the budgeted costs for fiscal year 1971-1972.

Using this simplified costing methodology, the estimated costs for fiscal year 1971-1972 of the Pasadena Police Department and its various organizational units, including the field policing function, were computed to be as follows:

<u>Organization</u>	<u>Major Expenditure Classes</u>			<u>Total</u>	<u>% of Total</u>
	<u>Personal Services</u>	<u>Non-Personal Expenses</u>	<u>Capital Outlay</u>		
		(\$000)			
Administration	\$ 197.8	\$ 27.6	\$ 6.6	\$ 232.0	5.5%
Investigative	736.3	51.8	---	788.1	18.7%
Detectives	445.4	42.4	---	487.8	
Juvenile	134.1	4.2	---	138.3	
Vice	156.8	5.2	---	162.0	
Staff Services	273.3	7.4	---	280.7	6.7%
Administration	108.2	1.8	---	110.0	
Public Affairs	165.1	5.6	---	170.7	
General Services	329.9	16.6	5.0	351.5	8.4%
Records	207.8	3.4	---	211.2	
Jail	104.2	2.1	---	106.3	
Laboratory	17.9	11.1	5.0	34.0	
Field Policing	2,835.8	214.2	---	2,550.0	60.7%
General Law Patrol	1,828.6	142.7	---	1,971.3	
Selective Enforcement Team	135.7	12.5	---	148.2	
Other Policing Services*	371.5	59.0	---	430.5	
TOTAL	\$3,873.1	\$317.6	\$11.6	\$4,202.3	100.0%

* Other policing services include motor units, helicopter, parking representatives, warrant detail, crossing guards and the patrol services unit.

Therefore, the direct costs of the field policing function were computed to be \$2,550,000 in fiscal year 1971-1972, or almost 61% of total police department costs.

The incremental increases (or decreases) in projected resource requirements in the field policing function for fiscal year 1972-1973 over those budgeted for 1971-1972 and their cost implications were computed to be as follows:

<u>Projected Resource Changes</u>	<u>Change in Number of</u>	<u>Average 1971-1972 Unit Costs (Annualized)</u>	<u>Estimated Cost Impact</u>
Manpower by type:			
Lieutenants	None	\$19,538	---
Sergeants	None	17,037	---
Agents	4	15,281	\$ 61,124
Policemen (Patrol)	8	13,768	110,144
Policemen (Motors)	(1)	14,368	(14,368)
Policemen (Helicopter)	None	16,168	---
Policewomen	None	13,706	---
Civilian	<u>None</u>	8,691	---
	11		<u>\$156,900</u>
Equipment by type:			
Patrol Cars	3	\$ 4,620	\$ 13,860
Motorcycles	(1)	1,260	(1,260)
Compacts	None	900	---
Scooters	None	600	---
Department head cars	<u>None</u>	1,320	---
	2		<u>\$ 12,600</u>
Facilities by type	None	---	---
Other Support Costs:			
About 5% of compensation costs			<u>7,800</u>
TOTAL INCREASED RESOURCE COST			<u><u>\$177,300</u></u>

The total projected direct costs of the field policing function in Pasadena for fiscal year 1972-1973 are estimated below:

<u>Cost Factors</u>	<u>Personal Services</u>	<u>Non-Personal Expense</u> (\$000)	<u>Capital Outlay</u>	<u>Total</u>
1971-1972 budgeted expenditures	\$2,335.8	\$214.2	---	\$2,550.0
Increased resource costs	<u>156.9</u>	<u>20.4</u>	<u>---</u>	<u>177.3</u>
	\$2,492.7	\$234.6	---	\$2,727.3
Possible negotiated salary increases @ 4%	99.7	---	---	99.7
Normal salary step progression of 5% for 50% of field policing personnel, including corresponding weighted fringe benefit expansion of 17.8%	73.4	---	---	73.4
Price increases of 3.6%	<u>---</u>	<u>8.4</u>	<u>---</u>	<u>8.4</u>
TOTAL	<u>\$2,665.8</u>	<u>\$243.0</u>	<u>---</u>	<u>\$2,908.8</u>

Therefore, the direct costs of the field policing function are forecasted to increase from \$2,550,000 in 1971-1972 to \$2,908,800 in 1972-1973, or an increase of 14%. It should be noted, however, that increased resource costs are estimated to rise only 6.9% while negotiated salary increases, normal pay step progression and price expansions could account for the remaining 7.1%.

(9) Comparison of field policing costs with available funds

In this particular illustration of the performance-cost being applied to Pasadena, the consulting team cannot determine what posture the Board of Directors or City Manager might take regarding the financing levels committed to the field policing function. However, if a 14% cost increase is not deemed acceptable, the tentative service level objectives previously established can be modified.

(10) Analysis of the benefits and costs of alternative approaches for providing field policing services

In Pasadena, benefit and cost analysis could be directed at a number of the alternative approaches described in Exhibit XV in Chapter II for providing field policing services at adequate levels within cost limits. In particular, analytical attention might be focused upon such considerations as:

- . The amount of back-up actually required among policing units and man hours which should be devoted to this workload activity.
- . Whether 35% of the field units deployed are required to be two-man units or if alternative and less costly methods for providing officer security are feasible.
- . The measured impact of the existing coverage pattern of the helicopter patrol in criminal apprehension, motorized unit support, crime repression and other forms of community service.
- . Whether non-operational "street time" could be reduced further.
- . The measured impact of the existing selective enforcement team in criminal apprehension and crime repression.
- . Different ways of programming and using crime repression "street time" and the impact of these alternatives on service levels and operational performance.
- . Approaches to more quickly deploy and balance field manpower with daily and hourly workload level changes.
- . Whether additional use could be made of the complaint desk, cadets, community service aides or reserve officers to handle some of the caseloads now handled by team policemen and agents.
- . The measured impact of team policing in the field on service levels and operational performance, including the balancing of caseloads with field unit availability.
- . Whether the manpower requirements now allocated to parking control, warrant detail and complaint desk are compatible with measured workload levels and service level objectives.

This type of on-going analysis should continue to aid decision-making in Pasadena in evaluating service levels, service delivery approaches and resource requirements.

2. The City of Commerce, California

Performance-cost decision-making for the field policing function can be used by a contract city in Los Angeles County as well as an independent city, like Pasadena. The applicability of the logic flow and analytical considerations of the decision-making system presented in Chapter II has been tested, tentatively, for the City of Commerce.

This city government currently contracts with the Los Angeles Sheriff for policing services. Commerce has a resident population of about 10,500 persons, within 6.6 square miles, and an extensive work day population (estimated by some at almost 60,000 persons) because of the large number of commercial and industrial enterprises located within its municipal boundaries. Its assessed valuation exceeds \$320 million and about 3,100 dwelling units currently exist.

(1) Forecast of community generated caseloads

Forecasts of community generated caseloads in the City of Commerce for incidents of a criminal nature and other community service requests have been based upon annual changes (increases and decreases) in caseloads from fiscal year 1966-1967 through 1970-1971. Since caseload statistics for fiscal year 1971-1972 were not yet compiled when these other trend data were collected, the estimated caseload for fiscal year 1971-1972 was projected

using the weighted annual percentage change in caseload volumes for major offenses, all other offenses, non-criminal incidents and traffic accidents. The estimated caseload for fiscal year 1971-1972 provided the base for forecasting the called for service volume for 1972-1973, using the same weighted annual changes in each of these four workload categories.

The forecasted called for service workload in the City of Commerce requiring police handling in fiscal year 1972-1973 is estimated to be as follows:

- . Recorded cases to be handled by the police are projected to reach almost 4,900, a 9.8% increase over the estimated workload for the previous fiscal year.
- . It is estimated that this caseload level will consist of:

	<u>Estimated Number</u>	<u>Weighted Annual Change 1966-1971</u>
- Seven major offenses	1,196	7.6%
- All other offenses	2,500	6.6
- Non-criminal incidents (less traffic accidents)	814	*
- Traffic accidents	<u>370</u>	<u>2.6</u>
	<u>4,880</u>	

* The weighted annual change of non-criminal incidents, including traffic accidents, was 15% from 1966-1967 through 1970-1971.

- . It is estimated further that routine disturbance of the peace incidents, which are not now recorded as a caseload statistic by the Sheriff's Department, could increase the projected caseload level by another 20%, or 976 incidents requiring handling by a police officer.

Therefore, overall caseloads for the police in Commerce are forecasted to be approximately 5,856 when disturbance of the peace calls are included in estimated workload levels.

Other associated workload activities which have been projected in fiscal year 1972-1973 are summarized below:

Total arrests are forecasted to reach approximately 1,691, a weighted annual increase of about 4.4% over the previous year. Of this number, about 132 could be warrant arrests.

Traffic citations (although not truly a community generated workload but rather officer initiated) are projected to be as follows:

	<u>Estimated Number</u>	<u>Weighted Annual Change 1966-1971</u>
- Hazardous citations	5,097	(1.7%)
- Non-hazardous citations	6,874	10.3
	<u>11,971</u>	

It is not known what percent of policing caseloads result from "on-view" actions of police officers. Therefore, no forecast has been made regarding the estimated number of "on-view" incidents which will be generated by officer initiated activities. However, when these data become known in the future, "on-view" cases should be excluded from forecasts of community generated caseloads.

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The Sheriff's Department offers both general law patrol (GLP) and traffic enforcement (TE) services and tries to separate these services by providing units dedicated to one or the other. When GLP units are busy, a traffic unit (traffic car, not motor unit) may be detailed the call. However, in determining the amount of each service required by the City of Commerce, it was assumed that only GLP units normally would handle calls for service (less traffic accidents) and related work activities like report writing and most arrests. Likewise it was assumed that only traffic units normally would handle traffic accidents, the issuance of traffic citations and drunk driving arrests.

The projected workload volumes in Commerce by activity and handling unit for fiscal year 1972-1973 are estimated to be as follows:

Handling Unit	Forecasted Activities			
	Cases Handled	Reports Written ^(a)	Arrests and Bookings	Citations Issued
GLP Unit	5,486	4,510	1,413	-
Traffic Enforcement Unit	370	370	278 ^(b)	11,971
Total	<u>5,856</u>	<u>4,880</u>	<u>1,691^(c)</u>	<u>11,971</u>

- (a) Sheriff personnel indicates that reports are written for all cases that are not considered routine disturbances--or only those cases which appear in the statistical summary.
- (b) It is estimated that drunk driving arrests will constitute 5.7% of the estimated caseload of 4,880, or 278. This arrest level is deducted from the total forecasted arrests of 1,691.
- (c) While a large portion of these estimated arrests probably are handled by station detectives, they are lumped under GLP/TEU categories for workload analysis purposes.

The normal practice of the Sheriff's Department is to provide an assisting (or back-up) unit for all cases involving an arrest and for selected cases of a more serious nature. Since 1,559 arrests have been forecast (which excludes 132 of the 1,691 arrests since they are warrant arrests), it is assumed initially that at least 1,559 cases will require back-up. In addition, an estimated 30% of the remaining cases ($4,880 - 1,559 = 3,321$) which do not involve arrest or disturbance calls are assumed to require assistance. This adds 996 potential back-up calls for a total of back-up incidents approximating 2,555.

(2) Establishment of tentative service level objectives and measurement criteria

Establishing, testing the validity of, and refining service level objectives for the contract policing function should be a continuing and jointly conducted task of City of Commerce officials and the Sheriff's Department. At present, formal and clearly defined service level objectives have not been fully articulated by the City except for indicating the number of units they wish to purchase. In making this determination, several approaches were employed by the City prior to the start of fiscal year 1972-1973, including:

Analysis of such indices as population (which increased only 10.3% during the past 10 years); square miles served (no change); assessed valuation (which increased 28.2% in 10 years); crime (which decreased 3.65% during 1971); other offenses (which increased 1.9% in 1971); traffic accidents (up 28% in 1971); traffic citations (up 6% for hazardous violations but down for non-hazardous or parking during 1971 for a total decrease of 15%); and arrests (with adult arrests increasing 2% and juvenile arrests 18%).

Discussion of program and tactical changes such as elimination of the parking enforcement officer, diverting the attention of other traffic units to parking control rather than accident prevention; use of citizen education programs like Operation Identification and home security checks to reduce major crime rates; rescheduling traffic units to provide around the clock coverage and thereby increasing drunk driving arrests and providing specialized accident prevention during the early morning hours; and noting that elimination of the helicopter program could affect crime rates in 1972.

As a result of this needs analysis, the Sheriff's Department recommended: (1) maintenance of the present level of contract service as measured by 1971-1972 units purchased; (2) the addition of a three-wheeled motorcycle parking unit; (3) the addition of an enforcement coordinator to serve in a community relations and liaison capacity; and (4) the city avail itself of several community relation programs, at no cost, such as the Neighborhood Car Plan, Adopt-a-Deputy and student and the law programs.

To illustrate the use of the performance-cost decision-making system, policing service level objectives for the City of Commerce have been tentatively established by the consulting team. They are:

Crime investigation

Maintain an average response time for all emergency called for services of no more than five minutes.

Maintain an average response time for all non-emergency called for services of no more than 20 minutes.

Community services

Same objectives as those for crime investigation.

Crime repression

Maintain a minimum of 50% of available street time of GLP units for officer initiated and programmed crime repression activities.

Schedule two property checks of potential burglary hazards for each GLP unit each shift.

Allow for five crime stops involving suspicious persons for each GLP unit each shift.

Provide sufficient patrol coverage so that, on the average, each point in the city visible from the street is passed by a patrol unit three times each shift.

(It should be noted that the services of scheduled property checks, crime stops and patrol coverage are identified activities that will be covered by the time allotted to crime repressions.)

Traffic control

Maintain, at a minimum, one traffic enforcement unit in the field 24 hours a day so that all traffic accidents requiring investigation and selected traffic enforcement can be handled by a policing unit which specializes in this service task.

Maintain a minimum of 50% of available street time by traffic enforcement units for routine patrol to observe potential traffic violations.

Maintain a specialized capability at the most economical cost for parking control during the second watch five days a week.

Field operations support

Maintain an aerial surveillance and back-up to field units capability four hours each day.

Provide back-up response capabilities for the following calls for service:

- Fights
- Loud parties
- Crimes in progress
- Silent alarms
- Fire calls
- Injury traffic accidents
- Officer arrests
- Pursuit (all available units)

Maintain a street time availability of at least 90% of scheduled on-duty time.

(3) Forecast of the volume of officer initiated workloads

Currently, the Sheriff's Department has only limited information on how field units utilize their non-called for service time, such as traffic citations issued. However, some estimates by Sheriff personnel of non-called for service time utilization have been made for such activities as crime stops and scheduled property checks. These estimates are reflected in the crime repression service level objectives.

(4) Measures of the average time required for each workload activity

The average man hours spent in handling different workload activities were not readily available from the Sheriff's Department. Therefore, the average man hours expended per workload activity in Pasadena were used for testing the performance-cost decision-making system in Commerce.

(5) Determination of the man hours required by type of field unit to handle projected workload volumes

The estimated number of man hours needed by type of field unit to handle forecasted community generated and officer initiated workloads, as well as achieve tentative service level objectives, are set forth in Exhibit XX, following this page. As noted in this analysis, the projected man hours are:

<u>Handling Unit</u>	<u>Estimated Man Hours Required for:</u>		
	<u>Called For Services</u>	<u>Other</u>	<u>Total</u>
General Law Patrol			
1-man units	7,610	11,943	19,553
2-man units	-	-	-
Helicopter	-	1,460	1,460
Traffic Enforcement			
1-man units	1,335	7,425	8,760
2-man units	-	-	-
Parking Control	-	2,080	2,080
	<u>8,945</u>	<u>22,908</u>	<u>31,853</u>

EXHIBIT XX

ESTIMATED FIELD POLICING MAN HOURS REQUIRED TO HANDLE PROJECTED
WORKLOADS AND ACHIEVE SERVICE LEVEL OBJECTIVES

Workload Units	Projected Volume	Man Hours Per Unit	Gross Man Hours	Forecasted man hours needed by:						Comments
				General Law Patrol			Traffic Enforcement			
				1-Man	2-Man	Helicopter	1-Man	2-Man	Parking Control	
<u>Called for Services</u>	<u>5,856</u>									
- General law patrol	5,486	.53	2,908	2,908			370			
- Traffic enforcement	370	1.00	370							
<u>Reports Written</u>	<u>4,880</u>									
- General law patrol	4,510	.33	1,488	1,488			278			
- Traffic Enforcement	370	.75	278							
<u>Arrests</u>	<u>1,691</u>									
- General law patrol	1,413	1.00	1,413	1,413			278			
- Traffic enforcement	278	1.00	278							
SubTotal				5,809			926			
<u>Backup</u>	<u>2,555</u>									
- General law patrol	2,146									
.. Arrests	1,413	1.00		1,413						Estimated at 84% for GLP and 16% for TEU which is the estimated ratio of arrests handled by each type of unit
.. Other	733	.53		388						
- Traffic enforcement	409									
.. Arrests	278	1.00					278			
.. Other	131	1.00					131			
SubTotal				1,801			409			
SubTotal				7,610			1,335			

Other Desired Time Uses	Forecasted Man Hours Needed By:						Comments
	General Law Patrol			Traffic Enforcement			
	1-Man	2-Man	Helicopter	1-Man	2-Man	Parking Control	
• Maintain a minimum of 50% of available street time of GLP units for officer initiated and programmed crime repression activities or adequate time for property checks, crime stops and patrol coverage objectives.	11,943						See note (a) below. The 11,943 man hours will provide 61% of duty time for various crime repression activities
• Maintain a minimum of 50% of available street time for routine patrol to observe potential traffic violations and maintain a specialized traffic accident investigation capability 24 hours per day.				7,425			It requires 8,760 man hours to provide 24 hour a day coverage. With an estimated workload of 1,335 hours, 7,425 hours remain for traffic patrol and traffic citation issuance.
• Maintain aerial surveillance and backup to field units capability of four hours each day			1,460				4 hours x 365 days
• Provide for specialized and low cost parking control on the day watch from Monday through Friday						2,080	8 hours x 260 days
Total Other Desired Time	11,943		1,460	7,425		2,080	
Total Workload Time	7,610		-	1,335		-	
TOTAL FORECASTED TIME	19,553		1,460	8,760		2,080	

- (a) The man hour requirements to achieve the tentative service level objectives for property checks, crime stops and patrol coverage are computed as follows: (1) two property checks requiring .25 man hours (or 15 minutes) each per GLP unit per shift would require 1,270 man hours a year (.50 man hours x average of 2.33 GLP units per shift = 1.16 hours x 3 shifts a day x 365 days = 1,270 hours); (2) five crime stops requiring .08 man hours (or 5 minutes) each per GLP unit per shift would require 1,018 man hours a year (.40 man hours x 2.33 GLP units per shift = .93 man hours x 3 shifts x 365 days = 1,018 man hours); and (3) patrol coverage which permits any point in the city, visible from the street, to be passed three times per shift would require 9,655 man hours with 58.78 miles of street in Commerce and a patrol speed of 20 miles per hour (58.78 \div 20 mph x 3 passes x 3 shifts x 365 days per year = 9,655 man hours). Therefore, the total man hours needed to meet these three objectives are 11,943.

(6) Determination of manpower availability for each type of field policing post

The manpower availability for a contract city is determined in a different way than that for an independent city. Contract cities purchase a policing post for one, two or three shifts either five, six or seven days a week. Therefore, the manpower availability for a policing post, in terms of net "street time" available per post, is estimated to be as follows:

- . The Sheriff's Department estimates that each GLP or TE unit spends .67 man hours in non-operational duty time (lunch, comfort stops and so on). Briefing time does not come out of duty time.
- . Therefore, about 734 man hours can be considered as non-operational duty time per 24 hours a day post (3 shifts per day X .67 man hours X 365 days = 734 hours).
- . Although a 24-hour a day post represents gross available duty hours of 8,760 hours, operational street time per post is only 8,026 hours (8,760 - 734 = 8,026).

(7) Determination of the number and type of field personnel or units needed to handle forecasted field workloads

The estimated number and type of field personnel or units required to handle projected field workloads are summarized below:

GLP units

19,553 man hours ÷ 8,026 operational time hours =
2.44 GLP units.

This estimated requirement is met closest by contracting for seven, 56-hour per week units (which provides 2,324 posts) and one 40-hour per week post (which provides .237 posts). The total posts contracted for are 2,561 which provides slightly more than the projected man hours desired.

TE units

8,760 man hours ÷ 8,026 operational time hours =
1.09 TE units

This estimated requirement is met closest by contracting for two 56-hour per week units and two 40-hour per week units (which provide 1.138 posts). The total posts contracted for of 1.138 TEU provides something more than the forecasted man hours desired.

Helicopter unit

Since helicopter service can be purchased by the hour, 1,460 flight hours will need to be purchased.

Parking control unit

2,080 man hours ÷ 1,906 operational time hours =
.258 units

This estimated requirement can be met by contracting for one 40-hour per week motor unit (which provides .237 posts) or using a civilian parking representative. This number of contracted units provides somewhat less than the forecasted man hours required.

A comparison of projected 1972-1973 field policing staffing requirements, as determined by the performance-cost decision-making system, with those recommended by the Sheriff and actually

purchased by the City of Commerce in 1972-1973 and 1971-1972 are summarized below:

	Equivalent Number of Around The Clock Posts:			
	<u>P-C System</u>	<u>Purchased By Commerce</u>	<u>Recommended By Sheriff</u>	<u>Purchased by Commerce Last Year</u>
GLP Units	<u>2,561</u>	<u>2,332</u>	<u>2,664</u>	<u>2,664</u>
- 2 1/2 units each day	-	2,000	2,000	2,000
- 1 man unit 7 shifts	2,324	-	.332	.332
- 2 man unit 7 shifts	-	.332	.332	.332
- 1 man unit 5 shifts	.237	-	-	-
TE Units	<u>1,138</u>	<u>1,138</u>	<u>1,711</u>	<u>1,711</u>
- 1 man unit 7 shifts	.664	.664	1,000	1,000
- 1 man unit 5 shifts	.474	.474	.711	.711
Helicopter	<u>1,460 hrs</u>	-	-	<u>500 hrs</u>
Parking Control	<u>.237</u>	<u>.237</u>	<u>.237</u>	<u>.237</u>
- 1 man unit 5 shifts	.237	.237	.237	.237

It should be noted that the performance-cost decision-making system computed GLP unit requirements on the basis of using one-man units rather than a mix of two-man and one-man units as is the current practice in Commerce. This particular decision is a candidate area for benefit and cost analysis as discussed later.

(8) Determination of the costs of forecasted field policing services

The costs of the projected field policing services desired in fiscal year 1972-1973 through the performance-cost decision-making system (and to meet the tentative service level objectives established) are determined by applying the various contractual rates of the Sheriff's Department.

Under the assumptions previously used, these estimated costs would be as follows:

<u>GLP Units</u>	<u>Unit Rate</u>	<u>Costs</u>
7 one man units @56 hours each	\$54, 981	\$384, 867
1 one man unit @40 hours each	39, 272	39, 272
2. 5% salary increase		10, 603
		<u>434, 742</u>
<u>Traffic Enforcements</u>		
2 one man units @56 hours each	58, 617	117, 234
2 one man units @40 hours each	41, 869	83, 738
2. 5% salary increase		5, 024
		<u>205, 996</u>
<u>Helicopter Unit</u>		
1460 hours	\$64. 40	94, 024
2. 5% salary increase		2, 351
		<u>96, 375</u>
<u>Parking Control</u>		
1 one man unit @40 hours	13, 123*	13, 123
		<u>13, 123</u>
	<u>Total Field Policing Costs</u>	<u>\$750, 236</u>

* Computed on the basis of 1. 2 civilian representatives @\$8, 280 in salary; 20% in fringe benefits, or \$1, 656; annual rental of a scooter at \$600; and supplies at \$400. This estimated unit cost is $10, 936 \times 1. 2 = \$13, 125$.

The estimated costs of contractual services to Commerce under the service levels it selected on July 1, 1972 were as follows:

<u>GLP Units</u>	<u>Unit Rate</u>	<u>Costs</u>
2, 2 1/2 man units around the clock	\$269, 073	\$538, 146
1 two man unit @56 hours each	107, 046	107, 046
2. 5% salary increase		16, 130
		<u>661, 322</u>
 <u>Traffic Enforcement Units</u>		
2 one man units @56 hours	\$58, 617	117, 234
2 one man units @40 hours each	41, 869	83, 738
2. 5% salary increase		5, 024
		<u>205, 996</u>
 <u>Helicopter Unit</u>	None	None
 <u>Parking Control</u>		
1 one man motorcycle unit @40 hours each	\$34, 026	34, 026
2. 5% salary increase		851
		<u>34, 877</u>
	 Total Field Policing Costs	 <u>\$902, 195</u>

The City of Commerce also contracted for 2.33 station detectives at \$86,751 and a half-time enforcement coordinator at \$16,149. However, these costs are normally not considered as part of the field policing function as described in this study.

In comparing the estimated costs of the field policing function as determined through the performance-cost decision-making system (\$750,236) with those service levels recently contracted for (\$902,195), a difference of \$151,959 exists. This difference is the result of:

- . The use of one-man units versus 2/1/2-man units now deployed in Commerce.
- . The use of a civilian parking representative on an inexpensive scooter for parking control duties rather than a deputy sheriff on a three-wheeler.

It is readily admitted that legitimate differences of opinion may exist regarding whether two-man or one-man units should be used for GLP units in the evenings and at night. This is a viable issue for further benefit and cost analysis to determine the advantages and disadvantages of such alternatives as:

- . Retaining the existing mix of two-man and one-man units in the field policing function.

- . Using two-man units only one shift rather than two, primarily during the evenings and early mornings (like 7 p.m. to 3 a.m.) when crime activity and policing workloads normally are the heaviest.
- . Adding at least two additional one-man units at 56 hours per week (at \$56,356 each) to improve the capability of dispatching two units to calls where a two-man handling force is considered necessary, as well as reducing potential response time delays because units are not available to handle a call.
- . Using the funds earmarked for the helicopter service to purchase two additional one-man units at 40 hours a week (for a unit cost of \$40,254) to further improve back-up and response time capabilities.
- . Using either a part-time reserve officer, police cadet or community service aide to ride with officers in patrol sectors or situations where two men are considered desirable.
- . Using K-9 units for evening and night patrol in large industrial complexes.

The use of a relatively inexpensive meter maid employed directly by the city rather than a sworn officer for parking control should also be subjected to benefit and cost analysis. However, this alternative appears to offer a relatively feasible approach for providing an adequate service level for parking control with a cost saving or avoidance approximating \$20,000 annually.

(9) Future Considerations

The application of the performance-cost decision-making system to the City of Commerce raises a number of questions to which subsequent analytical efforts will need to be addressed.

These questions include the following:

- . The full called for service caseload of the city which requires the dispatch of a police unit after reports taken or services provided by phone are considered, including the number of called for services which may not now be recorded.
- . The number of arrests which involve field policing units.
- . The number and type of cases generated by officers which are "on-view" and result from their initiative.
- . Whether it is possible to reduce the report writing requirements of field units or increase the number of cases which can be handled by phone or mail.
- . The control center processing and travel times of field units in responding to emergency and non-emergency called for services and the relationship of these response times to units assigned to field duty.
- . The number of traffic and parking citations issued by GLP, TE and parking control units.
- . The number of called for services and on-view actions which require one, two, three and four or more units to handle.

- . The measured amount of time required to handle various kinds of field policing workload activities.
- . The types and volume of activities which field units engage in when not handling called for services.
- . The actual "street time" available to field units when scheduled for duty.
- . The types and volume of activities generated by the helicopter unit.

V. IMPLICATIONS FOR CONTRACT CITIES

V. IMPLICATIONS FOR CONTRACT CITIES

This final chapter summarizes the implications of the findings from the case study of the field policing function in Pasadena as well as the design and application of the performance-cost decision-making system for cities in Los Angeles County who contract with the Sheriff's Department for police services.

1. A Perspective of the Field Policing Function

The task of policing a city is a mix of crime investigation, community service, crime prevention and traffic control activities which contribute to an overall goal of establishing an environment of peace and safety. In performing the policing task, each city will be responsible for:

- . Crime investigation - which involves the investigation of possible violations of penal laws, making arrests, where possible, of the persons responsible, and writing case reports.
- . Community service - which involves the provision of a wide range of non-crime related services when citizens feel the presence of an officer can help alleviate a problem.
- . Crime prevention - which involves the conduct of various types of activities geared to reduce crime investigation requirements and conditions which contribute to or cause criminal acts.

- . Traffic control - which involves the enforcement of traffic laws, assistance when traffic accidents occur, and the provision of various activities to reduce conditions which contribute to or cause traffic accidents and restrict the efficient movement of vehicles or pedestrian traffic.

The case study of the field policing function in Pasadena as well as other recent research on this topic have generated a number of findings which have implications for contract cities in Los Angeles County as they consider their police service needs. These findings include:

- . The field policing function consists of a wide range of service activities (like cases handled, arrests made, reports written, citations issued, street miles patrolled, inspections made, and so on) which can be defined and measured in terms of their time requirements. As a result, the time needed to accomplish various types of field policing service activities, coupled with the volume of these activities, provides a basis for determining the workload of field policing personnel or units. These workload data, in turn, can be used to identify the time utilization of policing personnel by type of service activity and, in part, establish desired staffing requirements.
- . When the various service activities of the field policing function are clearly understood and defined, it is possible to establish service level objectives, of ranging degrees of sophistication, which are capable of being quantified. For example, response time (the minutes required by the police to respond to a called for service) is important to many citizens, from the merchant just robbed to the housewife who has discovered her favorite rose bush missing. Also, the frequent sighting of police vehicles may instill a sense of security in many citizens, like elderly citizens in a remote neighborhood or mothers around schools and playgrounds. Furthermore, it is possible to link service level objectives, once established and after detailed analysis, to policing resource needs in terms of manpower, equipment and so on.

- . A changing range of alternatives currently exist for providing field policing services and each alternative probably has both benefits (advantages) and costs (disadvantages). The "one best way" for providing field policing services has yet to be found. Therefore, a continuing program of simplified and understandable benefit and cost analysis of police service alternatives is required to insure that the approaches and methods for providing these services at acceptable levels, of satisfactory quality, efficiently and economically, are maintained.

The question of how much police service a city should provide cannot be answered through the application of simplistic police manpower per population ratios or other possible formulas which have universal applicability. The tasks of policing a community today and determining necessary resource requirements are complicated by a number of factors:

- . Many unknowns currently exist regarding the various causes of crime and what approaches are most effective in controlling or preventing different types of criminal acts. It is generally recognized that collective efforts among police agencies and other public and private organizations are required to cope with the problems of crime and delinquency as well as social, economic and other considerations which may produce anti-social behavior. However, the most effective mix of crime control and prevention activities within and among each of these agencies has not been fully determined or tested.
- . Crime investigation and prevention are only two of several major service functions provided by the police. Community service or traffic control may be equally or more important to some citizens. Therefore, decisions regarding resource needs should take all types of service functions and their relative priorities into account.
- . Workload and other types of service activity and level data, useful in making resource determination decisions, often are not readily available to assist decision-making regarding police resource determinations.

In some cities and police agencies the decision-making process regarding police service needs and approaches for delivering services has been institutionalized and is somewhat inflexible. As a result, analytical attention to different ways of providing police services, and the benefit and costs of various alternatives, has been limited.

Although no single formula is available for rationally determining service requirements in the field policing function, the performance-cost decision-making system set forth in this report will provide a methodology to help improve the management decisions in this area.

2. The Policing Function in a Contract City

A municipality with its own police department assigns principal responsibility to the department for "full service" policing in terms of crime investigation, crime prevention, community service, traffic control and other related service activities. Direction and coordination of other city departments which perform services related to policing (like traffic engineering, security at parks, street lighting, and recreational services in high potential crime areas) are accomplished by the central management staff of the city government. Coordination with agencies not part of the city government which have impact upon and interface with policing problems (like probation staffs, courts, various rehabilitation programs, and other law enforcement agencies) becomes the responsibility of the police department. Integrated and unified decision-making among the city council, city manager and police chief is possible in determining police service levels as well as

resource requirements for the field policing function and support functions like supervision, communications, record keeping, training, community relations and so on.

The system of "contract law enforcement" in Los Angeles County provides a regional approach for policing. This regional approach has resulted from the provision of "full service" policing by the Sheriff's Department to several cities and unincorporated areas with common boundaries and served from a Sheriff's Department station. The rationale beyond this approach to policing makes sense. For each city to establish its own police department and provide services of comparable quality as the Sheriff could be expensive in terms of capital outlay and support personnel and functions (like communications, record keeping, training, specialized investigations support and so on). In addition, crime control efforts would be fragmented and could work to the disadvantage of each of the jurisdictions.

The Sheriff's Department is an established policing agency with an excellent reputation in law enforcement. It has high quality personnel who are well-trained. Because of its size, it has the capability to easily and quickly mobilize personnel and equipment to cope with most crime and non-crime problems and situations of an emergency nature as well as those which are routine. It has a headquarters staff of specialists readily available to support field operations at the stations. Furthermore, at the stations a cadre of support personnel and specialists also exist who are readily available to assist field officers in all jurisdictions served.

The Sheriff's Department provides an opportunity to assure each city it serves within a region that a uniform and high level of service will be maintained in terms of available personnel and response to requests for services. A relatively small or medium size city with its own police department would be hard pressed to achieve this objective because of uncertainties and staffing gaps created by personnel turnover, fluctuations in workload, training requirements, illness, and many other operational considerations.

Basically, the Sheriff's Department provides the crime investigation, community service, and traffic control services for a city. Crime prevention activities generally are provided through the conspicuous patrol of field units or helicopter patrol. It does assist and make available specialist personnel for other crime prevention activities involving efforts to mobilize communities to help police themselves.

The contractual law enforcement system in Los Angeles County is based upon philosophy of home rule in which the city council of the contracting city sets the level and type of policing service desired. This philosophy has prevailed, somewhat, given the normal difficulties encountered by councils, city managers, and even law enforcement officers in clearly defining service levels. The Sheriff, by virtue of his responsibility to assure that there is no breakdown in law enforcement in the county, has reserved the right to establish minimum service levels his department will provide a city if it chooses to contract for policing services.

The contract system remains a viable method of providing high quality policing services; provides a network of law enforcement in a region which is responsive, short of police agency consolidation; and does provide the means by which a city can retain home rule over its policing services without establishing its own department. However, the system for contracting for police services has not changed significantly since its inception in 1954. Primarily, the Sheriff's Department has determined, initially, the desired level and type of service to be provided each city. Each city generally has agreed to that determination, as it relates to basic requirements, with some modifications in basic service units purchased due to financing considerations. The city may opt to contract for additional services such as license inspections, traffic control, community relations, education officers for schools, and school safety officers. The Sheriff has translated this determination of basic needs into general law enforcement (GLP) and traffic enforcement (TE) units for which a city will contract. Included in the unit package are all essential support and administrative services and overhead except for station detectives which are now determined separately on the basis of the number of GLP units purchased (with one detective required for every 24 hours a day, 7 days a week GLP unit).

The system now employed in determining and contracting for police services in Los Angeles County is faced with similar difficulties encountered by other cities with their own police departments, namely:

- . The establishment of service level objectives which are more clearly defined and measurable (other than the number of GLP, TE or other types of specialized units purchased or crime and accident rates) as well as priorities among these objectives given limited funding capabilities.
- . The development of workload statistics and measures which more clearly reflect the time utilization and workload requirements of policing units.
- . The determination of measurable relationships between policing resources (manpower and equipment) and the achievement of various service level objectives.
- . The commitment of sufficient analytical time by contract cities to work with the Sheriff in evaluating the benefits and costs of alternative approaches for providing policing services given the financing levels which they have available for police services.

In addition, a contract city, unlike a city with its own police department, can exercise little control over various factors which affect the cost of the field policing function like the negotiated salaries and fringe benefits paid to police personnel, including time off requirements, and various support functions like clerical personnel, record keeping, supervision and so on. However, it should be noted that these costs are generally comparable among law enforcement agencies which are similar to the Sheriff in terms of the type, diversity, and quality of police services provided.

3. Implications of the Performance-Cost Decision-Making System for the Contractual Process Between the Sheriff's Department and Contract Cities

The performance-cost decision-making system described in Chapter II of this report and the specific work tasks that form the basis of this methodology are applicable to the contracting process which occurs between the Sheriff and contract cities, with some minor modifications. At a minimum, this decision-making methodology will have the following implications and should proceed along the lines outlined below.

(1) Forecasting community generated and officer initiated caseloads

The statistical records and reporting of the Sheriff's Department will require some modification to provide for the comprehensive caseload data needed to forecast field policing workloads, including:

- . Called for services, or requests for service that require the dispatch of a field unit to investigate an incident (criminal act, community service, or traffic accident). All called for services should be recorded by type of call even though a report is not normally generated (like for a disturbance of the peace call).
- . Reports written, by type of call and report.
- . Arrests made, by field units (GLP or TE units) and type of offense and whether persons were taken into custody or released on their own recognizance. Arrests made by other units in the Sheriff's Department, like detectives, should be tabulated separately by type of crime.

- . "On-view" actions by field units by type of incident through their individual initiative involving criminal acts or other community services, such as suspicious persons stopped.
- . Backup provided by GLP and TE units to other units having initial responsibility for handling a call or "on-view" action by type of incident and number of backup units deployed.
- . Other details assigned to field units which are not recorded elsewhere, by type of assignment, such as checking a designated street for speeding vehicles, a park for narcotic activity, a house or business; or prisoner transport.
- . Traffic citations issued for moving violations and traffic or warning stops made where no citation was issued.
- . Parking citations issued.

These types of workload activities, recorded by type of activity and type of handling unit (like GLP, TE and parking control units) will provide the statistical base for forecasting workload volumes by types of field units for the next fiscal year using the methodologies discussed in Chapter II. These forecasts should be made by the Sheriff's Department, and in sufficient detail, for review and analysis by contract cities.

It should be noted that the number of requests for police service, by type of request, handled directly by the Sheriff's substation and not requiring the dispatch of a field unit also should be recorded for review by a contract city.

(2) Determining the average time required for each type of workload activity

It is the understanding of the survey team that the Sheriff's Department has developed a time data base for various workload activities performed by field policing units. The methodology described in Chapter II for measuring time needs should be used for updating these man hour requirements by type of workload activity and conducting periodic audits of their current validity. A representative from the contract cities should participate in these updates and audits to insure everyone has a clear understanding of how work output time measures are established.

(3) Determining the tentative number of man hours required by field units for projected community generated and officer initiated workloads

In this modified work task, the forecasted workload volumes for community generated and officer initiated activities are each multiplied by measured time requirements to provide a tentative determination of the man hours needed by each type of field unit for each of these two field policing functions. This step is taken to provide a tentative picture of the committed field man hours required to handle projected workloads for community generated and, separately, officer initiated actions based on current field operations of the Sheriff's Department. In addition,

this tentative man hour determination will provide an information base to determine the potential man hour impact of various service level objectives subsequently established.

(4) Establishing service level objectives and measurement criteria

The methodology described in Chapter II for establishing service level objectives in the areas of crime investigation, crime repression, community service, and traffic control is applicable to contract cities. Some experimentation will be required to select service level objectives and measurement criteria which are most appropriate and acceptable to each city. Initially, it is anticipated that contract cities will be using desired response times and patrol time as two measures of service levels:

Average response times desired for emergency and non-emergency calls will need to be determined by careful analysis of existing response time data (the time required to receive, process, dispatch and travel to a call) by time of day and day of week and the relationship of these times to current field unit availability. Desired response times and the number of field unit assignments necessary to achieve them will need to be determined by following the analytical approach set forth in Chapter III.

. Average patrol time desired for GLP and TE units (that amount or percentage of time not committed to the handling of community generated workloads or issuing traffic citations) will need to be determined by professional judgements of the Sheriff's Department and continuing analytical efforts. The amount of patrol time desired, analytically, can be determined, in part, by evaluating the relationship of response times to called for service time percentages and programming how patrol time would be used for such activities as roving surveillance, crime stops, inspection checks, traffic stops, counselling incidents and other "on-view" actions. Also, findings regarding the relationship of patrol time to crime rates, which is being tested in the Kansas City experiment, should be monitored.

Formulating service level objectives and measurement criteria will be an important joint venture between the Sheriff's Department and contract cities. Decisions reached on quantifiable service level objectives for crime investigation, crime repression, community service and traffic control as well as benefit and cost analysis of selected issues will affect the tentative number of man hours needed for projected workloads as previously calculated. For example, if it is determined to batch certain lower priority calls for service, like the collection of check cases from a shopping center, anticipated called for service man hours could be reduced. Likewise, if it is decided to increase significantly traffic enforcement in terms of citations issued and warning stops made, anticipated workload hours in the area of traffic control could be expanded appreciably.

- (5) Determining the total number of man hours required by field units to accommodate projected workloads and achieve service level objectives

In this work task the total man hours desired for forecasted community generated workloads (called for services, reports, arrests, and backup) and officer initiated actions (traffic citations and stops, "on-view" actions, patrol coverage and so on) would be determined for each type of handling unit in a similar manner as set forth in Chapter II. This analytical step would provide a detailed breakdown of desired man hours to be spent by each type of handling unit (GLP, TE, parking control, and other unit types like community service officers) in the areas of crime investigation, crime repression, community service and traffic control.

- (6) Determining the manpower availability for each type of field policing post and the number and type of field personnel or units needed to handle forecasted field workloads

These determinations are made by following the procedure set forth in Chapter IV on the application of the performance-cost decision-making system to the City of Commerce.

(7) Determining the costs of forecasted field policing services

This determination is made by applying the various contractual rates of the Sheriff's Department to the number and types of field personnel or units required.

(8) Determination of additional support services required and their costs

Although the performance-cost decision-making system focuses solely on the field policing function, contract cities must also determine additional support services desired like station detectives, community relations, education, and school safety officers. However, the basic methodology of forecasting workload volumes, measuring time requirements for various work activities, establishing service level objectives, and determining man hour requirements would appear applicable in establishing the extent of these support service resources. It should be noted that currently the Sheriff's Department requires the services of one station detective for each round-the-clock GLP unit.

Except for station detectives, contract cities may either opt for any of the other specialized units of service provided by the Sheriff's Department or decide to provide some of these specialized services, like school safety talks, crossing guards, or license inspection, themselves.

(9) Determining total policing costs and whether projected funding levels are sufficient

If a contract city determines that funding levels available for policing services are insufficient, two options are available:

- . Modifying service level objectives previously established so that projected policing costs can be balanced against available funding.
- . Conducting benefit and cost analysis of alternative approaches for achieving service level objectives and handling projected workloads within available funding limits.

Benefit and cost analysis of alternative policing approaches and methods, potentially, can be aided by referencing Exhibit XV in Chapter II which provides a listing of some possible alternatives which might be tested in a contract city. It should be noted that the Sheriff's Department has a program of planning and research regarding policing problems and issues. Therefore, benefit and cost analysis of alternative approaches and methods is a logical joint venture of contract cities and the Sheriff's Department.

However, contract cities, collectively, may wish to consider the employment and cost sharing of one or two operations analysts to spend full-time in working with the Sheriff's Department on special project teams to provide on-going benefit and cost analysis of alternative field policing approaches and work methods. These operations analysts also could monitor the various and many research efforts being conducted elsewhere on police services to determine their possible applicability for contract cities.

As contract cities and the Sheriff's Department work together in implementing a performance-cost decision-making system, a modified reporting system will need to be established to periodically report on how well agreed-upon service level objectives are being achieved in contract cities.

APPENDICES

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APPENDIX A

PROFILE OF POLICING SERVICES
IN THE CITY OF PASADENA

The purposes of this appendix are twofold: (1) to present a statistical profile of the policing needs, resources, inputs and outputs in the City of Pasadena; and (2) provide a general methodology which city governments can use to more clearly identify and display demographic, workload, manpower, expenditure, input and output trends as they pertain to the field policing function.

1. POLICING NEEDS AND RESOURCE COMMITMENTS FOR THE PAST FIVE YEARS

To identify trends regarding policing needs and resource commitments for the City of Pasadena, five statistical profiles were developed from available information. These profiles focused upon general demographic characteristics, policing workload indicators, policing resources, broad input measures, and broad output measures. Appendix A-1, following this page, sets forth this profile information in tabular form and is summarized below.

(1) Demographic Characteristics

The residential population of the City of Pasadena has decreased over 4% since 1968 while the area served has increased slightly. Population density (the population per square mile) has decreased almost 6%. The lack of other detailed demographic data from the 1970 census does not permit a comparison of other demographic characteristics and trends at this time.

(2) Policing Workload Indicators

Five major indicators of policing workloads, particularly as they pertain to field policing forces were analyzed. These indicators and the percentage change from 1968 (1966 and 1967 data were not always available) were as follows:

APPENDIX A (2)

APPENDIX A-1

STATISTICAL PROFILES RELATED TO
OVERALL POLICING REQUIREMENTS
IN THE CITY OF PASADENA
1966 through 1971

I. DEMOGRAPHIC CHARACTERISTICS OF POLICING AREA

	Calendar Year					% Change	
	1966	1967	1968	1969	1970	1971	Since 1968
(1) <u>Residential Population</u>	<u>122,664</u>	<u>120,289</u>	<u>117,914</u>	<u>115,539</u>	<u>113,164</u>	<u>112,700</u>	<u>(4.4)</u>
(2) <u>Area in Square Miles</u>	<u>22.607</u>	<u>22.607</u>	<u>22.674</u>	<u>22.674</u>	<u>22.953</u>	<u>23,018</u>	<u>1.5</u>
(3) <u>Population Per Square Mile</u>	<u>5,426</u>	<u>5,321</u>	<u>5,200</u>	<u>5,096</u>	<u>4,930</u>	<u>4,896</u>	<u>(5.9)</u>

II. POLICING WORKLOAD INDICATORS

(1) <u>Called for Services</u> ^(a) (reported)	<u>NA</u>	<u>NA</u>	<u>34,132</u>	<u>42,264</u>	<u>52,433</u>	<u>63,731</u>	<u>86.7</u>
. Part I Index Offenses	4,177	5,143	6,353	6,978	7,234	8,179	28.7
. Other Part I & II Offenses	NA	NA	18,592	25,576	36,432	49,860	168.2
. Part III Offenses ^(b)	NA	NA	9,187	9,710	8,767	5,692	(39.1)
(2) <u>Part I Crimes Index Offenses (act.)</u>	<u>4,056</u>	<u>5,042</u>	<u>6,254</u>	<u>6,855</u>	<u>7,111</u>	<u>8,099</u>	<u>29.2</u>
. Crimes against Persons	378	587	766	860	989	1,108	44.6
. Crimes against Property	3,678	4,455	5,488	5,995	6,122	6,971	27.0
. Annual Crime Index Per 100,000 Population	3,306	4,192	5,304	5,933	6,284	7,169	35.2
(3) <u>Arrests</u>	<u>4,023</u>	<u>4,353</u>	<u>4,628</u>	<u>4,743</u>	<u>4,889</u>	<u>4,990</u>	<u>7.8</u>
. Part I Index Offenses ^(c)							40.6
- Against Persons	302	428	435	500	542	545	25.3
- Against Property	738	890	1,051	1,136	1,183	1,544	46.9
- Other Part I & II Offenses	2,938	3,035	3,142	3,107	3,124	2,901	(2.7)

(a) Estimated data which includes some traffic accidents investigated.

(b) Prior to 1971, "Incident Reports Only" (IRO) were classified as Part III offenses. Now they are classified as Part II offenses.

(c) Includes arrests for larceny under \$50 in value.

APPENDIX A (3)

APPENDIX A-1 (2)

	Calendar Year					% Change	
	1966	1967	1968	1969	1970	1971	Since 1968
(4) <u>Traffic Accidents</u>	<u>3,705</u>	<u>3,713</u>	<u>3,524</u>	<u>4,640</u>	<u>4,773</u>	<u>4,592</u>	<u>30.8</u>
. Fatal	16	14	17	11	17	8	(33.8)
. Injury	1,164	1,107	1,064	968	945	930	(12.6)
. Property Damage Only	2,525	2,592	2,443	3,661	3,811	3,654	49.8
(5) <u>Non-Parking Traffic Citations</u>	<u>26,820</u>	<u>26,038</u>	<u>18,395</u>	<u>24,136</u>	<u>26,095</u>	<u>22,170</u>	<u>24.2</u>
(6) <u>Workload Indicators Per Capita</u>							
. Called for services	NA	NA	.289	.366	.463	.565	95.5
. Crime Index Offenses	.033	.042	.053	.059	.063	.072	35.2
. Other Part I & II Offenses	NA	NA	.158	.221	.322	.442	180.5
. Part III Offenses	NA	NA	.078	.084	.077	.050	(34.7)
. Part I Index Arrests ^(c)	.008	.011	.013	.014	.015	.018	47.1
. Other Part I & II Arrests	.024	.025	.027	.027	.028	.026	(3.2)
. Traffic Accidents	.030	.029	.030	.042	.042	.041	36.3
- Fatal and injury	.010	.008	.009	.010	.008	.009	(9.2)
- Property Damage only	.020	.021	.021	.032	.034	.032	56.5
. Non-Parking Traffic Citations	.218	.216	.156	.209	.230	.197	29.6

III. POLICING RESOURCES

(1) <u>Available Police Employees (FTE)</u>	<u>208</u>	<u>207</u>	<u>241</u>	<u>253</u>	<u>257</u>	<u>258</u>	<u>7.0</u>
. Sworn	176	171	183	192	191	194	6.0
. Non-Sworn	32	36	58	61	66	64	10.4
(2) <u>Available Police Employees in the Uniform Division</u>	<u>118</u>	<u>116</u>	<u>123</u>	<u>138</u>	<u>142</u>	<u>138</u>	<u>12.3</u>
. Captains	1	1	1	1	1	1	
. Lieutenants	4	5	5	5	5	5	
. Police Sergeants	14	14	13	13	14	13	
. Police Investigators	14	15	14				
. Police Agents				14	14	14	
. Policemen	84	80	84	87	88	83	
. Policewomen			2	2	2	2	
Total Sworn	117	115	120	122	124	118	(6.2)
Total Non-Sworn	1	1	4	16	18	20	400.0

APPENDIX A (4)

APPENDIX A-1 (3)

	Calendar Year						% Change Since 1968
	1966	1967	1968	1969	1970	1971	
(3) <u>Police Employees Available for Field Patrol^(d)</u>	<u>109</u>	<u>106</u>	<u>108</u>	<u>111</u>	<u>113</u>	<u>107</u>	<u>(0.7)</u>
(4) <u>Average Number of Police Personnel Available for Field Patrol Each Shift^(e)</u>	<u>22</u>	<u>22</u>	<u>22</u>	<u>23</u>	<u>23</u>	<u>22</u>	
(5) <u>Available Police Vehicles</u>	<u>65</u>	<u>67</u>	<u>64</u>	<u>86</u>	<u>84</u>	<u>87</u>	<u>35.9</u>
. Compacts	0	0	1	9	9	12	
. Department Head	0	1	1	1	1	2	
. Police Patrol	16	17	18	28	28	31	
. Police Detective	17	17	17	27	27	27	
. Solo Motorcycles	19	19	20	10	9	5	
. 3-Wheel Motorcycles	10	10	4	0	0	0	
. Helicopters	0	0	0	2	2	2	
. Parking Scooters	0	0	0	6	6	6	
. Vans	3	3	3	3	2	2	

	Fiscal Year						(\$000)
	66-67	67-68	68-69	69-70	70-71	71-72	
(6) <u>Police Expenditures (estimated)</u>							
. Salaries	2,044	2,182	2,536	2,756	3,208	3,406	
. Retirement	171	193	216	452	508	446	
. Workmen's Compensation ^(f)	100	120	134	15	21	27	
. Health Insurance	<u>21</u>	<u>20</u>	<u>22</u>	<u>33</u>	<u>33</u>	<u>42</u>	
SubTotal	<u>2,336</u>	<u>2,515</u>	<u>2,908</u>	<u>3,256</u>	<u>3,770</u>	<u>3,921</u>	<u>34.8</u>
. Non-Personal Services	178	215	199	286	359	338	
. Capital Outlay	13	17	12	109 ^(g)	23	14	
Total	<u>2,527</u>	<u>2,747</u>	<u>3,119</u>	<u>3,651</u>	<u>4,152</u>	<u>4,273^(h)</u>	<u>37.0</u>

(d) Excludes captains, lieutenants, a desk sergeant each shift, and policewoman. Includes helicopter personnel but not the special enforcement team.

(e) Computed by dividing available field manpower by 1.62 to account for time off and dividing this by three shifts.

(f) Pasadena became "self-insured" for Workman's Compensation Insurance effective July 1, 1969.

(g) Extraordinary expense includes the purchase of two helicopters.

(h) Estimated by doubling expenditures for the first six months.

APPENDIX A (5)

APPENDIX A-1 (4)

	Calendar Year					%Change Since 1968	
	1966	1967	1968	1969	1970		1971
IV. <u>BROAD INPUT MEASURES</u>							
(1) <u>Policing Expenditures</u>							
. Per Capita (\$)	-	21.0	23.3	27.0	32.3	36.8	57.9
. Per Police Employee (\$000)	-	12.2	11.4	12.3	14.2	16.1	41.2
. Per Average Patrolmen Available Each Shift (\$000)	-	114.7	124.7	141.7	158.7	180.5	44.7
. Per Part I Index Offenses (\$)	-	501	439	454	513	513	16.8
. Per Called for Service (\$)	-	-	80	74	70	65	-
. Per Part I & II Arrests	-	580	593	657	752	832	40.3
(2) <u>Police Employees Per 1,000 Population</u>							
. Sworn	1.43	1.42	1.55	1.66	1.69	1.72	10.9
. Non-Sworn	.26	.30	.49	.53	.58	.57	16.3
Total	1.69	1.72	2.04	2.19	2.27	2.29	12.2
(3) <u>Police Employees Available for Field Patrol</u>							
. Per 1,000 Population	.89	.88	.92	.96	1.00	.95	
. Per Square Mile	4.82	4.69	4.76	4.90	4.92	4.65	
(4) <u>Average Number of Employees Available For Field Patrol Each Day</u>							
. Per 1,000 Population	.54	.54	.56	.60	.61	.59	
. Per Square Mile	2.92	2.92	2.91	3.04	3.01	2.87	
(5) <u>Average Number of Police Officers Available Each Shift</u>							
. Per 1,000 Population	.18	.18	.19	.20	.20	.20	
. Per Square Mile	.97	.97	.97	1.01	1.00	.96	

APPENDIX A (6)

APPENDIX A-1 (5)

	Calendar Year						% Change Since 1968
	1966	1967	1968	1969	1970	1971	
V. BROAD OUTPUT MEASURES							
(1) <u>Called for Services Handled</u>							
. Per Police Employee	-	-	141	167	204	247	75.1
. Per Police Employees Available for Field Patrol	-	-	315	380	463	595	88.2
. Per Day	-	-	93.5	115.8	143.6	174.6	86.7
. Daily Per Police Officer Available for Field Patrol	-	-	1.4	1.7	2.1	2.6	85.7
(2) <u>Part I Index Crimes Handled</u>							
. Per Police Employee	19.5	24.4	26.0	27.1	27.7	31.3	20.4
. Per Police Employees Available for Field Patrol	37.2	47.6	57.9	61.8	62.9	75.5	30.4
. Per Day	11.1	13.8	17.1	18.8	19.5	22.2	29.8
. Daily Per Police Officer Available for Field Patrol	.17	.21	.26	.27	.28	.37	42.3
(3) <u>Part I and II Arrests</u>							
. Per Police Employee	19.3	21.0	19.2	18.7	18.9	19.3	0.6
. Per Sworn Officers Available	22.8	25.4	25.3	24.7	25.6	25.7	1.6
. Per Available Police Agents, Policemen and Policewomen (1)	30.5	33.7	35.9	35.7	35.7	36.1	0.5
. Per Police Employees Available for Field Patrol	36.9	41.1	42.9	42.7	42.9	46.6	8.6
. Per Day	11.0	11.9	12.7	13.0	13.4	13.7	7.9
. Daily Per Police Officer Available for Field Patrol	.17	.18	.19	.19	.19	.21	10.5
(4) <u>Non-Parking Citations Issued</u>							
. Per Police Employee	125	126	76	95	102	86	16.7
. Per Police Employees Available for Field Patrol	239	246	170	217	231	207	23.6
. Per Day	73.5	71.3	50.4	66.1	71.5	60.7	24.2
. Daily Per Police Officer Available for Field Patrol	1.08	1.08	.76	.96	1.04	.92	19.2

(1) In the Administration, Investigations and Uniform Divisions

APPENDIX A (7)

<u>Workload Indicator</u>	<u>% Change Since 1968</u>	<u>Annualized Rate of Change</u>
<u>Called for Services (estimated)</u>	<u>86.7%</u>	<u>28.9%</u>
. Part I Index Offenses	28.7	9.6
. Other Part I & II Offenses	168.2	56.1
. Part III Offenses	(39.1)	(13.0)
<u>Part I Crime Index Offenses</u>	<u>29.2%</u>	<u>9.7%</u>
. Crimes against Persons	44.6	14.9
. Crimes against Property	27.0	9.0
<u>Arrests</u>	<u>7.8%</u>	<u>2.6%</u>
. Part I Crime Index Offenses	40.6	13.5
- Against persons	25.3	8.4
- Against property	46.9	15.6
. Other Part I & II Offenses	(2.7)	(0.9)
<u>Traffic Accidents</u>	<u>30.8%</u>	<u>10.3%</u>
. Fatal and injury	(13.2)	(4.4)
. Property Damage only	49.8	16.6
<u>Non-Parking Traffic Citations</u>	24.2	8.1

In analyzing these workload trends, some general conclusions can be drawn:

- . Called for services have increased over three times as fast as Part I crime index offenses. The policing workload of field forces primarily consists of other Part I incidents (like non-aggravated assault and larceny under \$50) and the wide range of Part II and III offenses.
- . Crimes against persons (murder, forcible rape, robbery, and aggravated assault) remain the major Part I crime index problem of the department since they have an annualized rate of growth of almost 15% since 1968.

- . The annualized rate of increase of arrests for crime index offenses since 1968 has grown faster than the rate of change for these offenses (13.5% compared to 9.7%, respectively). Arrests for crimes against property have increased 15.6%, annualized, while actual offenses have grown only 9.0%. However, the annualized arrest rate change for crimes against persons is only 8.4% compared to a 14.9% annual growth rate for these offenses.
- . In contrast, the rate of change for arrests for other Part I and II offenses has decreased about 1% annualized while these offenses have increased over 50% on an annual basis.
- . Although traffic accidents, overall, show an annualized rate of increase of over 10% since 1968, fatal and injury accidents have decreased over 4% on an annual basis.

These comparisons suggest that the Pasadena Police Department has had some success in keeping pace (in terms of arrests) with the crime index element of its total policing workload and the reduction of traffic accidents involving injuries and fatalities even though workloads have been increasing dramatically.

In comparing policing workload trends and levels to the city's residential population, other interesting findings include the following:

- . In 1971, one out of every two persons could have been involved in a call for service involving a Part I or II offense. Since 1968, the possibility of each resident being involved in a call for police assistance for those incidents has increased almost two and one-half times.
- . In 1971, about one out of every 14 residents could have been a victim of a crime index offense. In 1968, this victimization rate was one out of every 19 persons.

(3) Policing Resources

Policing resources and their aggregate and annualized rate of change since 1968 are summarized below:

<u>Resource</u>	<u>Number In 1971</u>	<u>% Change Since 1968</u>	<u>Annualized Rate of Change</u>
<u>Available Police Employees</u>	<u>258</u>	<u>7.0</u>	<u>2.3</u>
. Sworn	194	6.0	2.0
. Non-Sworn	64	10.4	3.5
<u>Available Employees In Uniform Division</u>	<u>138</u>	<u>12.3</u>	<u>4.1</u>
. Sworn	118	(6.2)	(2.0)
. Non-sworn	20	400.0	133.3
<u>Police Available for Field Patrol</u>	<u>107</u>	<u>(0.7)</u>	<u>(0.2)</u>
<u>Average Number of Police Available for Field Patrol Each Shift</u>	<u>22</u>	<u>No Change</u>	<u>No Change</u>
<u>Available Police Vehicles</u>	<u>87</u>	<u>35.9</u>	<u>12.0</u>
<u>Police Expenditures</u>	<u>\$4,273,000</u>	<u>37.0</u>	<u>12.3</u>
. Personal Services	3,921,000	34.8	11.6
. Other	352,000	66.8	22.3

In analyzing these data, it is clear that:

- . The cost of policing resources has risen over five times faster than the manpower committed to the policing function.
- . The manpower available for policing in the field has not changed significantly since 1968 (with about 22 sergeants and police officers available each shift). It should be noted, however, that the equivalent of another eight field

officers (for an average of five per day) are available for field duty. These police officers function as a "special enforcement team" under the direct supervision of the Deputy Chief of Police. Also, since 1968, the number of available field personnel in the Investigations Division (sergeants, detectives, police agents and officers) has increased from 36 to 39. This represents a percentage change for this three year period of 8.3%, or an annualized rate of 2.8%.

(4) Broad Input Measures

Analysis of generalized input measures of policing services provided by the Pasadena Police Department can be summarized as follows:

- . The cost per capita of police services has increased from \$23.30 in 1968 to about \$36.80 in 1971. This represents an annualized cost increase of 19.3% per capita. On the average, at any time of day, there currently is about one field officer for every 5,000 persons and each square mile of area served.
- . The cost per average field officer available each shift (field sergeants and police officers) has increased from about \$124,700 in 1968 to \$180,500 in 1971. This represents an annualized cost increase of 14.9%.
- . Due to the rapid increase in the department's policing workload, the cost of each called for service has decreased from \$80 in 1968 to \$65 in 1971.

(5) Broad Output Measures

Generalized output measures for the Pasadena Police Department (particularly as they apply to field policing forces) have been identified. The broad outputs for each police officer (field sergeants, police agents, and patrolmen) available each day for field patrol for 1968 and 1971 are as follows:

<u>Work Output</u>	<u>1968</u>	<u>1971</u>	<u>% Change Since 1968</u>	<u>Annualized Rate of Change</u>
Called for services handled	1.40	2.60	85.7%	28.6%
Part I Index Crimes handled	.26	.37	42.3	14.1
Part I & II Arrests	.19	.21	10.5	3.5
Non-Parking Citations Used	.76	.92	19.2	6.4

From these trend data, it seems clear that the average field officer for the Pasadena Police Department is handling an increasingly heavier workload. These workload data will be refined further for calendar year 1971 in an appendix which follows.

A graphic representation of several selected policing workload and resource commitments are set forth in Appendix A -2 following this page.

2. USES OF STATISTICAL PROFILES OF POLICING SERVICES IN MEDIUM-SIZED CITIES

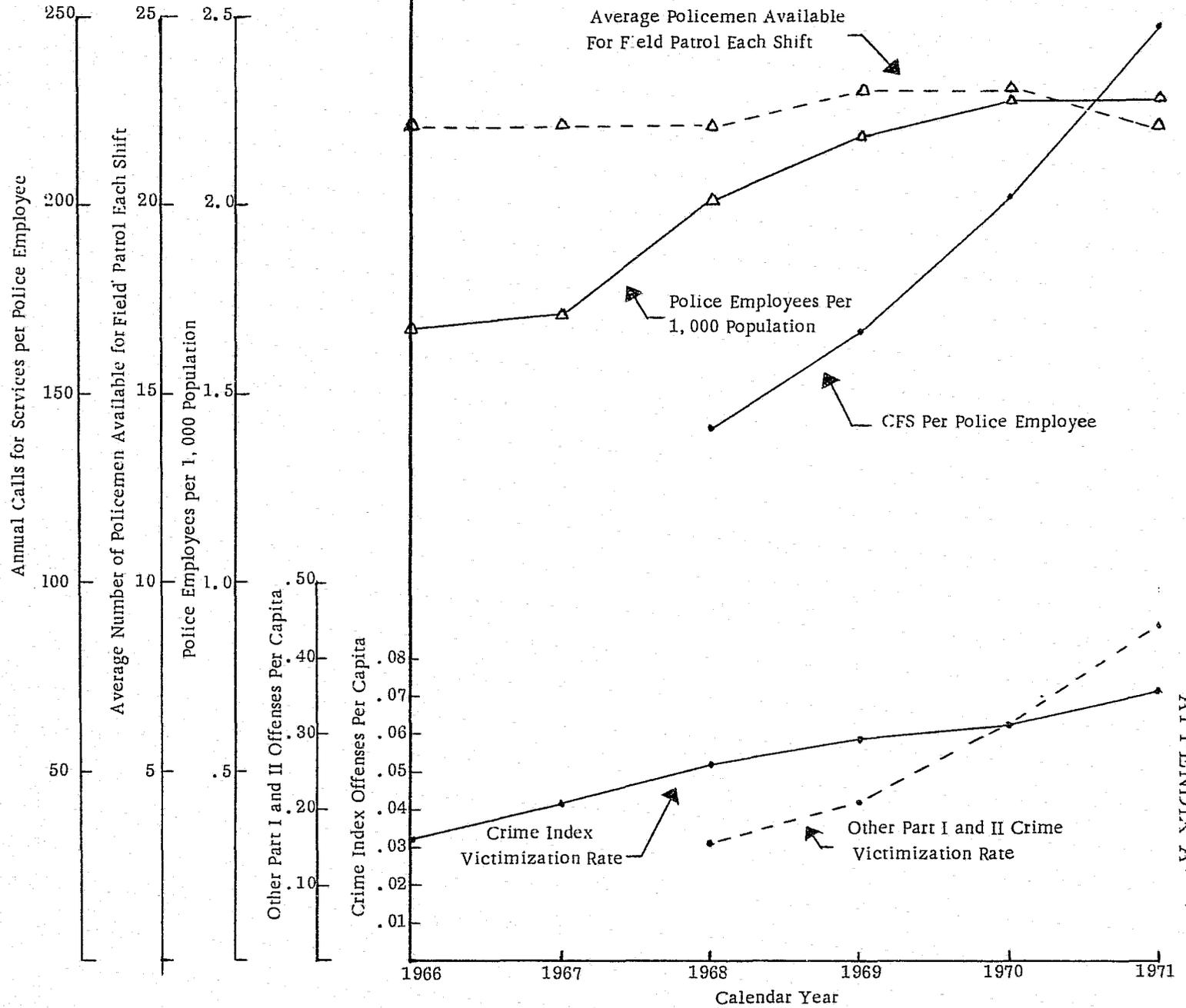
The formats for the statistical profiles of policing services developed for the City of Pasadena can be used by other medium-sized cities to more clearly display trend information regarding policing activities. Too many police departments still restrict their data presentations (particularly when budget decisions are being made) to trends in crime index offenses, aggregate caseloads, arrests and police/population ratios compared with other cities.

For city officials to have a clearer perspective and understanding of the police function, they should be provided with five year trend data and yearly changes on: (1) demographic characteristics in the city; (2) various policing workload indicators and levels; (3) manpower levels, by type; (4) expenditures by category; (5) broad policing inputs like expenditures per capita; and (6) broad policing outputs like cases handled per officer available for field patrol. These data, particularly the various input and output measures, provide a better picture of the magnitude of resource commitments to and outputs received from the police department.

In analyzing broad police input and output measures, particular attention should be given to levels and changes in:

- Policing costs per capita, police employees, and average number of field officers available each shift.

SELECTED POLICING WORKLOAD AND RESOURCE TRENDS
FOR THE CITY OF PASADENA



APPENDIX A (13)

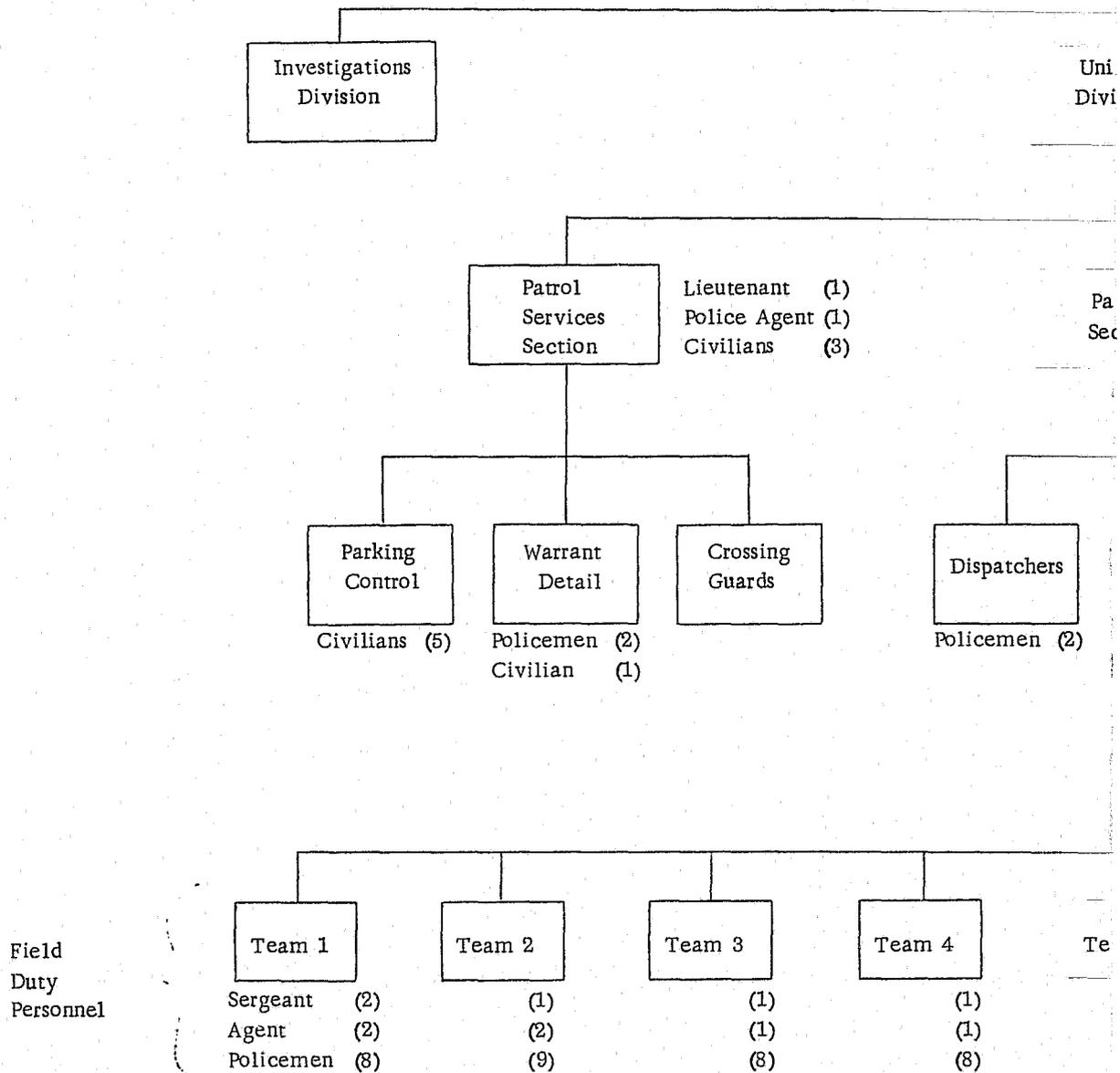
APPENDIX A-2 (2)

	<u>1967</u>	<u>1968</u>	<u>1969</u>	<u>1970</u>	<u>1971</u>
1. Annual Calls for Service/ Police Employee	278.4	259.8	259.7	240.3	248.3
2. Average Number of Policemen Available Each Day for Field Patrol	26	26	37	38	39
3. Police Employees per 1,000	2.20	2.30	2.47	2.62	2.71
4. Part I Index Offenses Per Capita	.062	.079	.075	.067	.069
5. Other Part I & II Offenses Per Capita	.130	.125	.130	.168	.154

- . Average number of field officers available each shift and per square mile and per 1,000 population.
- . Average called for services, arrests, and traffic citations handled each day and per field officer available.

These data help provide insights regarding: (1) the financial support provided by the community for policing and cost of police service units; (2) density of field manpower on a geographical coverage and population basis; and (3) the average workloads of officers in the field.

APPENDIX B



Field
Duty
Personnel

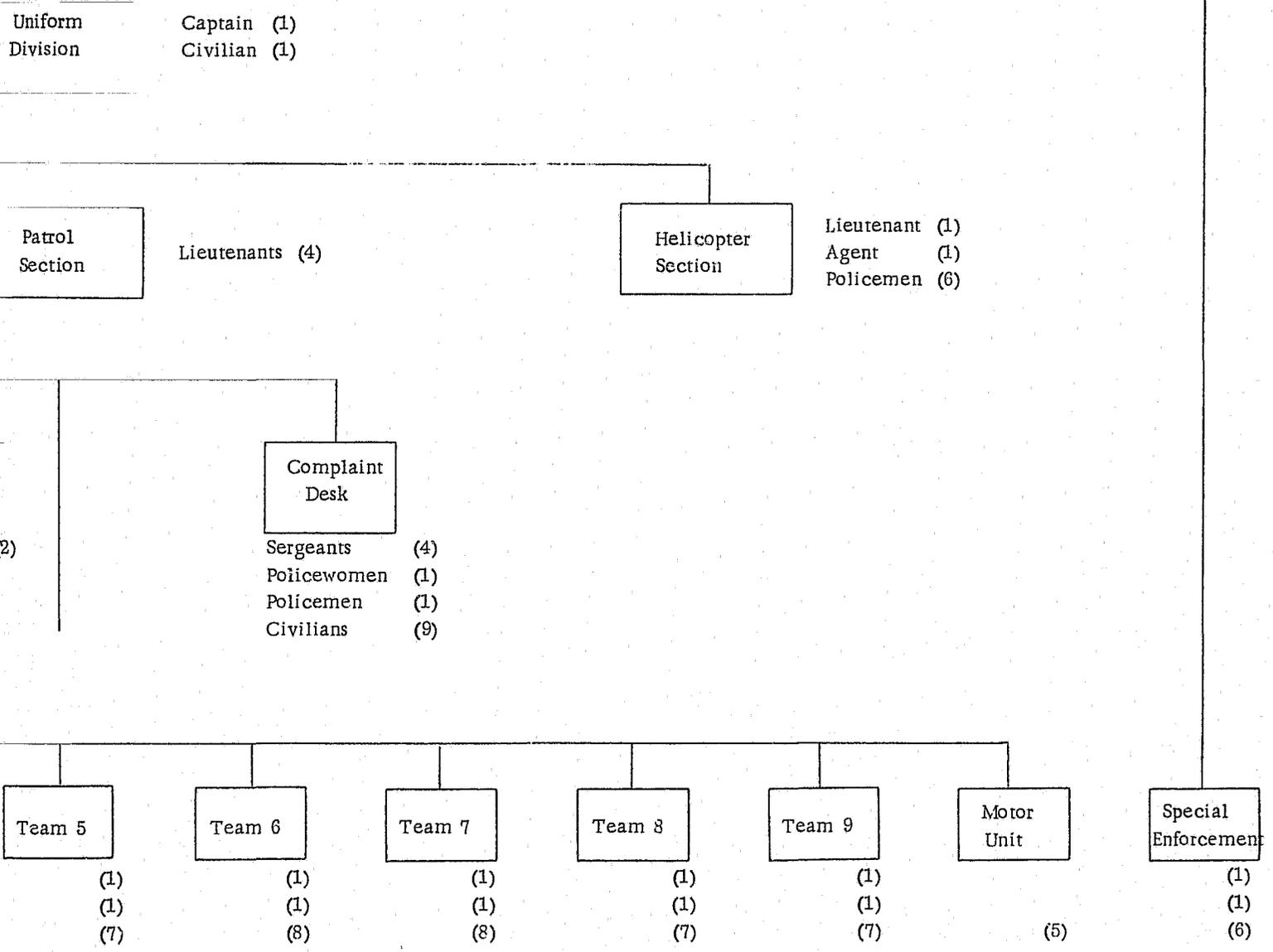
<u>Totals</u>	
Captains	(1)
Lieutenants	(6)
Sergeants	(15)
Agents	(14)
Policemen	(92)
Policewomen	(1)
Civilians	<u>(19)</u>
	148

Available for
Field Duty
(excluding Helicopter)

-
-
(11)
(12)
(81)
-
-
<u>104</u>

ORGANIZATION AND AVAILABLE STAFFING FOR
THE FIELD POLICING FUNCTION IN PASADENA
FEBRUARY 1972

Operations Bureau



APPENDIX C

EXISTING SYSTEM FOR DETERMINING SERVICE
LEVELS AND FIELD POLICING REQUIREMENTS IN PASADENA

This appendix presents an analysis of the existing decision-making system used in Pasadena for establishing service levels, resource needs, and tactics for providing field policing services. This description of the existing system is based upon interviews with City officials and police personnel, on-site observations, and review of various management reports and documents.

1. METHODS USED IN ESTABLISHING SERVICE LEVELS AND
RESOURCE NEEDS FOR FIELD POLICING ACTIVITIES

The quantitative and qualitative approaches which have been utilized by the Pasadena Police Department to establish service levels and resource requirements, as they pertain to field policing activities, are described and analyzed below.

(1) Broad Policing Goals And Some Specific Objectives Have Been
Formalized

The formalized and overall goals of the Pasadena Police Department have been described as follows:

- . Protect life and property against criminal acts.
- . Create an environment of stability and security.
- . Prevent crime and delinquency.
- . Provide services to individuals and other governmental units.

For fiscal year 1971-1972, the stated objectives of the Police Department to the City Manager were to "stop or reduce the increase of major crimes involving burglary, car theft and purse snatching." These specific objectives represent an attempt to define a service level commitment. However, target levels for the reduction of these crimes (expressed either in terms of the number of crimes in these various categories or crime rate considered acceptable) were not defined or quantified and the City Manager did not respond to or approve these objectives.

In 1970, the Uniform Division (which is responsible for most field policing activities) informally established a number of goals which attempted, in part, to define various and broad service levels for field policing forces. These included:

- . Achieving maximum efficiency and effectiveness and making every attempt to hold criminal offenses at the lowest possible level.
- . Improving response time and increasing patrol observation and officer security through the use of helicopter patrol.

However, specific measures for determining whether these goals were being achieved were not stated in quantitative terms, and regular reporting of the status of efforts to accomplish these goals did not take place. This goal setting effort was primarily a management exercise and not part of an official departmental program.

It should be noted the "goal setting" efforts as part of a "management by objectives" program are now being initiated by the City Manager for municipal departments. This program is being instituted to help document and clarify the missions and results anticipated from the various municipal departments, including the police. It is anticipated that the regular reporting of achievements in relation to predetermined police goals and objectives will become part of the management reporting system.

(2) Formalized Service Level Or Performance Indices Related To Field Policing Activities Generally Have Not Been Developed Or Utilized

Possible quantitative measures of service or performance levels for field policing activities (other than the number of crimes by categories or crime rates) have received only limited development and use. For example:

- . Response times (the minutes required from receipt of a call to the arrival on the scene of a field unit) have been recorded on most incident cards in the communications center but are not tabulated for regular management analysis and use. The adequacy of response times has been determined primarily from public complaints on "slow rolls" and police personnel consider

these complaints are minimal. The response times of field units for various types of calls (either by type of incident or its priority), time of day, or geographical area are not known.

- . Time which is available for routine patrol and other crime or accident prevention activities by type of field unit (such as police agents, patrol units, and motor units) and time of day is not computed or documented statistically. Similarly, the amount of time spent by each field unit on called for services and report writing, arrest and booking activities is not maintained. It should be noted that most police personnel feel the called for service workload is excessive and uncommitted time for crime repression is low or virtually non-existent on most shifts. However, data is not now maintained to support or refute this opinion.
- . Other possible measures of field policing service or performance levels, such as the number of officer initiated "crime stop" contacts made by patrol units, traffic enforcement indexes and miles patrolled are not now used and data relevant to these activities are not maintained or collected and displayed in a format for operations analysis and planning.

The existing manual data system within the department has not been structured to support the measurement of service or performance levels of field policing activities. For example, the number of Part II and III incidents, by type of offense or incident, has not been maintained. Moreover, the use, analysis, and summary of information in activity logs for individual officers has been discontinued because the information collected was considered inaccurate.

Without defined and quantitative measures of service or performance levels for field forces and an information system to provide continuous and reliable data, the department has had to rely upon limited and traditional statistical information such as:

- . Analysis and comparison of the number of FBI crime index offenses by category with previous months and years in Pasadena and other cities of a similar population size.
- . Analysis and comparison of arrest trends by crime categories and clearance rates for Part I offenses.

APPENDIX C (4)

- . Analysis and comparison of vehicle accident trends involving fatalities, personal injury and property damage only.

It should be noted that the Police Department, in a joint venture with a private firm, is in the process of designing and installing an automated information system. This system will provide:

- . For any crime category, the number of incidents of that type that occurred within a specified time period in a specific geographical location.
- . Information regarding a specific case which includes time, place, victim, loss (if any), handling officer and final disposition.
- . The number of incidents occurring in a specific geographical area during a specified time period.
- . In summary form, the total number of incidents of any type occurring in one month by day of week and time of day.
- . In summary form, the total number of incidents of any type occurring in one month by location.

It is anticipated that the system will include a workload analysis which will provide such information as:

- . The number and type of incidents handled by a specific officer during a specified time period.
- . The amount of time expended by any officer in handling incidents during a specified period.

The limited availability of quantitative measures of service or performance levels for field policing activities and supporting statistical data has necessitated that various qualitative approaches be used to evaluate the adequacy of service and performance levels, including:

- . Analysis of the quality of offense reports prepared by officers.

- . Assessment of community attitudes toward police services as expressed in letters, phone calls and comments at community meetings.
- . Impressions gained by watching police officers on duty.
- . Discussions with watch commanders and field sergeants and their evaluations of field operations.

(3) The Approach Used Internally By The Police Department To Determine Needed Field Strength Has Been Based Primarily On A Comparison Of Crime And Caseload Increase Trends With Available Field Manpower

The budget request from the Uniform Division to the Chief of Police for fiscal year 1971-1972 attempted to document field police manpower needs by using the following logic system:

- . Showing the dramatic numerical and percentage increases of Part I crimes and total incidents reported for Part I, and then II and III offenses from calendar year 1965 through 1970 (about 70% and 56% respectively).
- . Showing the actual field strength for December in each of these years which included policemen but excluded motor officers, radar unit operators, dispatchers, special enforcement team, helicopter unit and warrant detail. This analysis revealed an aggregate increase of only 20% in field strength (from 54 to 65 officers).

It should be noted that this budget request indicated the field staffing strength from calendar year 1965 through 1968 increased about 38% (from 54 to 83 officers) when the department was reorganized and various policemen were returned to the Uniform Division from their previous assignments to other units and replaced with civilian personnel. However, between 1968 and 1970, field strength was reduced from 83 to 65 due to the creation of a special enforcement team (which required 7 men), assignment of 3 officers to the helicopter detail, assignment of several officers to other service units (like the Community Relations Unit) and unfilled vacancies. Therefore, it was requested that 15 men be added in fiscal year 1971-1972 to bring policemen field strength in the Uniform Division up to the level of 79 men recommended when the 1968 departmental reorganization took place. It should be noted the Chief of Police requested only seven additional officers to replace the men assigned to the special enforcement team.

Interviews with police personnel concerning the methodology used to determine and document field policing requirements and analysis of the above logic system employed by the Uniform Division indicate the following:

- . The field strength of 79 policemen recommended for patrol duty by the 1968 reorganization survey (and which was considered the minimum staffing level upon which the 1971-1972 budget request of the Uniform Division was based) was primarily developed through the professional judgment and experience of departmental personnel and analysis of departmental workloads at that time.
- . The exclusion of motor officers, radar unit operator, and special enforcement team from calculations of available field strength fails to consider that these units, although specialized, handle (in varying degrees) called for services like accidents or other public service requests and engage in crime suppression patrol activities, particularly the special enforcement team.
- . The impact of helicopter patrol in handling or supporting field workload requirements and, particularly, as an alternative to adding patrol units for expanded patrol coverage was not considered.

These factors, however, have been taken into account by the Chief and Deputy Chief in framing manpower requests.

However, it should be noted that as part of the 1968 reorganization effort an analysis was made by the department of the manpower utilization of police personnel using data from calendar year 1966. This analysis, presented in a somewhat altered and summarized form, is set forth in Appendix C-1, at the end of this analysis. This workload evaluation allowed the department, in forming its 1968 reorganization plan, to draw the following conclusions, particularly as related to field manpower:

- . Recruitment and retention problems decreased field manpower availability significantly from authorized strength.
- . Available manpower for field duty was reasonably deployed since the time spent in various workload categories did not differ appreciably among shifts.

APPENDIX C (7)

- . In the Uniform Division, the man hours allocated to supervisory activities were about 15% of the total Uniform Division strength.
- . The areas of criminal and miscellaneous investigations accounted for the largest percentage of time patrol units (about 35%), except for motor officers and parking control.
- . The first shift showed a higher percentage of time spent on parking control than other shifts because of the City ordinance prohibiting on-street parking between 2:00 am and 6:00 am.
- . The need for maximum patrol unit coverage, use of one-man cars, where feasible, and corresponding need for backup resulted in from 7% to 12% of field time being spent in intradepartmental assistance.
- . Slightly less than one hour was available per unit each shift for patrol, including breaks, driving to and from details, and repressive patrol. Additional man hours were considered necessary for this activity.
- . The time spent by on-duty officers in court could be lessened if arrangements could be made with the courts to reduce stand-by time.
- . Little time was available for field personnel to expand their public relations activities or provide other public services.

This initial workload analysis has not been updated or refined since 1966 to provide a foundation for determining or documenting subsequent field manpower requirements or service needs. In addition, the manual data system in use was not designed to regularly produce comprehensive workload statistics for field policing forces. Only the monthly report of the helicopter patrol provides workload information relating to flight hours and details handled, by type.

The manpower request prepared by the Chief of Police for the Personnel Director for fiscal year 1971-1972 reflected an improved attempt to document staffing requirements for the Uniform Division on the basis of more quantitative manpower availability and workload data. For example, this analysis indicated the following:

Overall manpower availability for policemen

The 98 policemen positions available in March 1971 were utilized as follows:

<u>How Utilized</u>	<u>Number</u>	<u>% Of Total</u>
Assignment to field patrol	62	63.2
Special enforcement team	6	6.1
Motor squad	7	7.1
Helicopter patrol	3	3.1
Warrant detail	2	2.0
School resource officers	4	4.1
Planning and research	1	1.0
Jail	2	2.0
Dispatchers	4	4.1
Light duty	1	1.0
Leave of absence (military and education)	3	3.1
Recruit school	3	3.1
	<u>98</u>	<u>99.9%</u>

Average policemen assigned on March 2

<u>Shift</u>	<u>Policemen</u>		<u>Caseload</u>	
	<u>No.</u>	<u>%</u>	<u>No.</u>	<u>%</u>
1st watch	11	29	34	26
2nd watch	15	39	44	34
3rd watch	12	32	51	40
	<u>38</u>	<u>100%</u>	<u>129</u>	<u>100%</u>
Handled by Other Personnel	--		40	

This analysis also indicated the (1) the average number of cars available in the field was less than the policemen available since some officers were paired for safety reasons; and (2) each newly recruited officer was unavailable for about six months due to three months in the academy and another three months in a coach-pupil situation. Although seven additional policemen were requested to meet the operating needs of the Uniform Division, alternatives were presented in the event additional staff was not authorized, including curtailment of the special enforcement, motor squad or school resource officer program.

(4) At The Council-Manager Level, Several Factors Appear To Be Considered In Making Decisions Regarding Police Service Levels And Field Staffing Requirements

Factors which appear to affect decisions regarding police service levels and associated staffing needs at the Council-Manager level include:

- . The financial resources available to the City government and priorities attached to funding requests from various municipal departments.
- . Analysis of the nature and magnitude of crime problems and whether additional manpower will, in fact, reduce or control these problems.
- . General attitudes regarding the workload of police officers and whether existing work tasks require trained policemen or can be performed by less expensive civilian personnel.
- . General attitudes regarding how citizens feel about the police services they receive through public contacts with various City officials.
- . The confidence level which exists between top management personnel in the Police Department and City officials.
- . General attitudes regarding the department's willingness to consider and initiate alternative policing tactics and operational changes, including those outside the operational purview of the department, like improved street lighting, traffic engineering and physical planning and control, as they relate to crime prevention.

It should be noted that the department and City officials do not use a policeman per 1,000 population ratio as an approach for determining police staffing requirements.

The serious financial restrictions facing the City government the past several years have resulted in the Pasadena Police Department looking for alternative ways of providing field policing services within the limited funds available for police services. Rather than focusing significant attention upon ways to document and justify increased field staff, emphasis has been placed on attempts to improve policing efficiency and instituting new policing tactics.

2. APPROACHES EMPLOYED TO MEET FIELD SERVICE REQUIREMENTS

During the past four years, emphasis in the Pasadena Police Department has been placed on improving the efficiency of field personnel, particularly manpower utilization and experimenting with different patrol tactics. Many of these changes have resulted from a major in-house organization and operations study conducted by police personnel in fiscal year 1967-1968 and entitled "Reorganization of the Police Department". The reorganization study and other subsequent changes in field policing operations are summarized below.

(1) The Overall Organization Of Field Policing Services Was Modified

Organizational changes which were instituted to strengthen the management of field policing services include the following:

- . An Operations Bureau, headed by a Deputy Chief, was created to strengthen the communications and working relationships between the Uniform and Investigative Divisions. Formerly these two divisions each reported directly to the Chief of Police. The Operations Bureau was also considered necessary to facilitate expansion of the tentative "team policing" concept which was initiated in 1967. This program grouped various uniform personnel in designated portions of the City, all with equal responsibility for law enforcement in a geographic area and under a more unified supervisory system.
- . A special enforcement detail was formally established, under the Deputy Chief of Police, to provide close crime control in areas where serious problems exist. This task force (which recently consisted of a sergeant, police agent and six officers) has been working flexible hours in uniform or plainclothes, on foot or in cars. This unit, typically, has not answered calls for service.
- . The Traffic Bureau was abolished in its historical form and traffic enforcement officers integrated with other field patrol units. The number of police officers assigned to the motorcycle patrol was decreased from 2 sergeants and 17 officers to 8 police officers initially to provide 11 more sworn personnel to the basic patrol force. This move reflected the department's judgment that traffic control was a responsibility of all field forces; selective enforcement for traffic and quality regulation, including the

use of radar, would maintain adequate enforcement levels; mutual aid agreements with the Los Angeles Sheriff and other agencies would allow major emergencies and special event requirements to be covered; the small dollar trade-off between a reduction of \$13,500 for motorcycle rental and \$15,000 for five more patrol vehicles was more than offset by a potential utilization of 168 hours each week for a patrol car as compared to only 40 hours for a motorcycle; the City would save \$6,600 in bonus pay for motor officers; and the injury factor and related insurance costs would be less. Currently, the motor unit consists of about five police officers.

A Patrol Services Section was created to assume the traffic analysis and engineering activities of the old Traffic Bureau, special events planning and scheduling, involving traffic control, parking enforcement (using civilian parking representatives) and the two-man warrant detail issuing criminal warrants.

The Police Reserve Corps was reorganized so that it could function more like other community service organizations with its members assuming greater responsibility for internal operations. At the time of the 1968 reorganization study, although 150 personnel were authorized for the corps, the existing strength was only 16 members. Since that time, active membership has been increased to about 30 personnel serving one shift per month.

(2) A Different Skills Mix Was Established With Emphasis On The Increased Use Of Civilian Personnel

The 1968 reorganization plan resulted in a significant increase in the use of less expensive civilian personnel (both in terms of salaries and fringe benefit costs) for various police tasks related to field policing workloads. For example:

The police cadet program was modified to provide for a 20 hour work week (instead of 40) to allow cadets to take more college work. Also, cadets were reassigned from just clerical activities to tasks in the jail unit, photo lab, traffic direction at planned events, house inspection for vacationing residents, patrol training with officers, and service on the complaint desk.

- Community service aides (seniors in high school) were recruited at a lower salary than cadets to work 20 hours per week in minor clerical tasks, serve subpoenas and represent the department in various youth organizations.
- The position of police clerk was created (exclusively female employees) to perform matron, clerical and information desk duties. This position was established to relieve sworn personnel and professionalize the position of policewoman (who were performing some clerical tasks).

It should be noted also that a program of school resource officers was initiated to spend full time in improving communications, understanding and dialogue between the department and the City's youth. Several police officers were assigned to develop this program which is based primarily in the schools.

(3) Steps Have Been Taken To Reduce Police Officer Involvement In Various Lower Priority Work Tasks

Over the past several years, efforts have been made to relieve trained police officers of a number of lower priority work tasks, including:

- Certain public assistance tasks like house or vehicle lock-outs. Attempts are made to screen these requests at the complaint desk and have them handled by cadets, aides or referred to other more appropriate agencies like the Fire Department or Emergency Center.
- "No parking" sign posting, City treasury escorts, mail pickups, non-emergency portable traffic signal transportation, transportation of police vehicles to and from the repair garage, bicycle licensing, escort of ambulances on routine illness and injury cases, and miscellaneous City errands. Also, animal calls are no longer handled by the police.
- Lost property reports and petty theft reports which are taken at the complaint desk.

As noted earlier, house checks for vacationing residents and subpoena services generally are handled by cadets or aides. Criminal warrants are handled by the two-man warrant detail.

(4) Several Other Policy Decisions And Techniques Have Been Made To Conserve Police Officer Time In The Field

To conserve police officer time, the following steps have been taken:

- . Detailed and formal vehicle collision investigations by a police agent are to be made only in cases involving felonies, death, injury requiring hospitalization, City liability, hit and run, and driving "under the influence." Other collisions are to be handled by a patrol officer with only a brief report prepared.
- . Transportation of a lone prisoner who is male, non-combative and involved in a misdemeanor may be made by one officer if the prisoner is properly cuffed. All other prisoners in custody require two men.
- . A new reporting system (incident only report) was established in 1969 which permits an officer, by radio, to report an incident as IRO which is minor or requires no extensive investigation. The dispatch card with this information is forwarded directly to the Records Section without further involvement by the officer. The IRO procedure eliminates the need to prepare more detailed investigative documentation for about 50% of total police incidents which occur.
- . Field and station releases for misdemeanor suspects were initiated in 1969 to reduce officer time needed for the more time consuming tasks of suspect transport to the jail and booking.
- . The electronic want-warrant system established by the Los Angeles County Sheriff was put in use in 1970 by the Pasadena Police Department. This system has reduced delay times for field units in receiving answers to inquiries from at least 15 minutes to less than a minute.

(5) A Helicopter Patrol Was Initiated

A helicopter patrol has been established and now consists of a lieutenant, police agent and six police officers. This unit is scheduled to operate two shifts per day with four to five flight hours per shift. This patrol approach was initiated due to the following reasons:

- . Its potential ability to provide extensive, conspicuous and random patrol coverage. For example, flying at 60 mph, the helicopter could patrol 60 square miles every hour. Other studies have indicated it would take 15 additional patrol cars to achieve this patrol coverage.
- . Its potential ability to reduce high speed chases by patrol units by directing ground units to block and capture suspects.
- . Through high intensity lighting, its potential for lighting areas like traffic collision locations and areas where suspects are hiding or persons are lost.
- . Its quick response time in providing backup to officers on the ground.
- . Its potential to spot fires, direct traffic control activities, provide life saving transportation and assist in inspections involving multi-story buildings.

Over the past six months, significant study and discussion have occurred over ways to reduce the significant amount of time (about 53 flight hours per month) required to travel to and from Brackett Field and refuel at El Monte (both locations outside the City of Pasadena).

(6) Other Approaches Have Been Initiated To Improve Field Patrol Performance

Other steps which have been taken to potentially improve the performance of field patrol units include the following:

- . Establishment of the "4/10" plan to provide a vehicle for better distribution of field patrol manpower according to workloads by time of day and day of week.
- . Expansion of the "team policing" concept to place five operational teams (each consisting of a sergeant, one or two police agents and six to eight police officers) in the field each day. These teams were established so that each team could be held accountable for the policing results in their patrol area during their tour of duty and could learn to work together as a team.

APPENDIX C-1

ANALYSIS OF MANPOWER USAGE FOR POLICE PERSONNEL IN
THE PASADENA POLICE DEPARTMENT
CALENDAR YEAR 1966I. OVERALL MANPOWER AVAILABILITY

(1) <u>Authorized Personnel</u>	<u>Number</u>	<u>%</u>	<u>Number</u>	<u>%</u>
• Sworn	183	83%		
• Non-Sworn	<u>38</u>	<u>17</u>		
	221	100%		
(2) <u>Available Personnel</u>				
• Average number due to recruitment and retention problems	212			
• Attrition factor		4%		
• Availability factor		96%		
(3) <u>Manhours Available</u>				
• 212 x 261 working days x 8 hours			442, 656	
• Time off for:				
- Vacations	19, 352			
- Holidays	3, 807			
- Sick leave	9, 968			
- Injured on duty	3, 360			
- Military leave	<u>12, 008</u>			
			<u>(48, 495)</u>	
			394, 161	

Note: This analysis was conducted by departmental personnel as part of the reorganization effort in 1967-1968.

II. ALLOCATION OF MAN HOURS AMONG SERVICE FUNCTIONS

(1)	<u>Non-Sworn Personnel</u>	<u>Number</u>	<u>%</u>
	38 persons	69,024	
(2)	<u>Staff and Auxiliary Personnel</u>		
	Chief and Assistant	2	
	Captains	3	
	Jail, Records, Training Lieutenants	3	
	Public Information Officer	1	
	Traffic Analyst	1	
	Range Master	1	
	Community Relations Officer	1	
	Jailers	<u>8</u>	
		20	37,816
(3)	<u>New Officers in Six Week Academy</u>		
	11 persons x 30 days x 8 hours		2,640
(4)	<u>Line Functions</u>		
	Uniform Division	205,560	
	Detective Division	43,312	
	Juvenile Division	22,634	
	Vice-Narcotics	<u>13,168</u>	
		<u>394,161</u>	

III. ALLOCATION OF MAN HOURS WITHIN THE UNIFORM DIVISION

	<u>Number</u>	<u>%</u>
(1) <u>Supervision</u>	32,208	
Lieutenants as shift commanders and desk and field sergeants		
(2) <u>Desk and Dispatching</u>	22,992	
(3) <u>Field Operations</u>	150,360	
. 1st shift	29,454	
. 2nd shift	31,704	
. 3rd/midwatch	51,090	
. Motor units	27,840	
. Parking control	<u>10,272</u>	
(4) <u>Total</u>	<u>205,560</u>	

APPENDIX C-1 (4)

IV. HOW FIELD OPERATIONS TIME WAS UTILIZED

Workload Categories	Percentages of Time Spent By:				
	Shift 1 Personnel	Shift 2 Personnel	Shift 3/ Midwatch Personnel	Motor Officers	Parking Control
1. Investigation of criminal and non-criminal incidents	32.0%	34.0%	38.0%	6.5%	10.5%
2. Traffic enforcement involving citations or warnings	4.0	2.0	4.5	22.0	2.0
3. Parking control	3.0	0.5	1.0	0.5	27.5
4. Assistance to other officers such as traffic direction at accidents, crossing guard relief, transportation details and back-up to other officers	7.5	9.0	7.5	11.5	12.5
5. Report writing	14.0	19.0	17.0	3.0	6.0
6. Patrol, including travel time, breaks and personal time	19.5	12.0	11.0	34.5	12.0
7. Training, including assembly and briefings for one-half hour prior to each shift and on-duty training	7.0	10.0	7.5	8.5	10.5
8. Judicial, including on-duty appearance in court and service of warrants and subpoenas	3.0	7.0	2.0	2.0	2.5
9. Public relations, including speeches, police tours and recruiting	1.5	1.0	1.5	3.0	7.0
10. Public service, including house checks and mediating civil disagreements	4.0	2.0	0.5	4.0	2.0
11. Assistance to other City departments like fire responses, transporting vehicles and taking deposits to the bank	3.0	3.0	3.0	3.5	3.0
12. Miscellaneous services, like checking vehicles at start of shift, gasing cars and desk relief	1.5	0.5	1.5	1.0	5.0
Total	100.0%	100.0%	100.0%	100.0%	100.0%

APPENDIX C-1 (5)

V. HOW TIME WAS UTILIZED IN THE INVESTIGATIVE DIVISION

Workload Categories	Percentage of Time Spent By:		
	Detective Bureau	Juvenile Bureau	Vice Bureau
1. First reports taken for specialized details like forgery	6.0%	3.0%	3.5%
2. Office follow-up	37.0	33.0	32.0
3. Field follow-up	23.5	15.0	28.0
4. Specialized follow-up	1.0	2.0	0.5
5. Assisting other agencies	2.0	1.5	1.0
6. Patrol, including checking high frequency crime areas	2.0	3.5	10.0
7. Report writing	8.5	12.0	12.0
8. Public relations, including speeches	1.5	1.5	3.5
9. Training	1.0	1.0	1.0
10. Prisoner transportation	1.0	5.5	0.2
11. Miscellaneous, including personal time	3.0	6.5	0.3
12. Serving subpoena and warrants	3.5	1.0	4.0
13. Reviewing case with prosecutors	2.5	2.0	1.0
14. Presenting cases in court	7.5	3.5	3.0
15. Female custody control	---	9.0	---
Total	<u>100.0%</u>	<u>100.0%</u>	<u>100.0%</u>

APPENDIX D

EVALUATION OF MANPOWER UTILIZATION
FOR PASADENA'S FIELD POLICING FORCES

This appendix provides an analysis of the estimated workload and manpower utilization in calendar year 1971 of Pasadena's field policing forces, including policemen and police agents assigned to patrol unit teams, special enforcement team, and motor units. This analysis was conducted by:

- . Collecting, editing, tabulating and analyzing (using radio call slips for a four week period) the time requirements for handling each offense or incident classification and work activities by type of field unit.
- . Obtaining supervisory estimates and conducting on-site field observations of the average time requirements for other workload activities not tallied on radio call slips.
- . Analyzing various statistical reports pertaining to annual gross caseloads, traffic enforcement activities, arrests, field staffing assignments and time off requirements.

These data were used to estimate how field manpower was used in 1971 and identify possible factors and data gaps which relate to decision-making on the performance and cost of the field policing function.

1. ESTIMATED WORKLOAD AND MANPOWER USAGE FOR FIELD UNITS

The estimated workload and field manpower utilization for calendar year 1971 are set forth, in detail, in Appendix D-1, following this page. The information contained in this appendix is summarized below.

I. FIELD POLICING WORKLOADS

A. Volume of Work Requested by Community or Initiated by Officers

Workload Units ^(a)	Average Handling Time			Field Policemen	Uniformed Agents	Special Enforce- ment Team
	For Travel if Unit Dispatched	On-Site If CFS	On-Site If OV Case			
	(In Minutes)					
. Part I Offenses	8.8	28.0	27.9	10,508	128	59
. Part II Offenses	10.4	19.2	18.7	30,145	2,672	386
. Part III Incidents	9.8	21.5	16.5	12,627	286	296
				<u>53,280</u>	<u>3,086</u>	<u>741</u>
% Total Work Units Handled by Category and Detail				83.2%	4.8%	1.1%
. Arrests and Bookings	60 Minutes			2,402	←	470
. Reports Written (Non-IRO)	20 Minutes - Field Policemen 45 Minutes - Agents			25,905	1,193	727
. Traffic Enforcement						
- Parking Citations	3 Minutes			12,465	-	136
- Non-Hazardous Citations	10 Minutes			2,299	-	144
- Hazardous Citations	15 Minutes			9,083	-	396
- Warnings	5 Minutes			2,845	-	135

B. Man Hours Required if Only One Man Utilized to Handle Each Work Unit

. Calls for Services and On-View Actions	27,308	1,493	269
. Arrests & Bookings	2,402	←	470
. Reports	8,631	597	243
. Traffic Enforcement	3,513	←	141
Total Man Hours	<u>41,854</u>	<u>2,090+</u>	<u>1,123-</u>

C. Policies or Operational Procedures Increasing Man Hours Required

. Use of two man versus one man patrol units	14,649		416
. Backup or assistance to other field units, other police departments or city agencies like the Fire Department		Data not available but this factor could b	
Total Adjusted Man Hours	<u>56,303</u>	<u>2,090+</u>	<u>1,269-</u>

(a) The volume and time requirements for workload elements for the calendar year were extrapolated from detailed workload statistics collected and analyzed for a consecutive four week period from September 27 through October 24, 1971. CFS designates a called for service which required the dispatch of a field patrol unit. OV represents an on-view service which was either initiated by the action of an officer in the field or did not go through the dispatching process since an officer was readily available.

APPENDIX D (2)

APPENDIX D-1

ESTIMATED WORKLOAD AND FIELD MANPOWER USAGE FOR CALENDAR YEAR 1971 IN PASADENA

Number of Work Units Handled by Details on First Response Basis

enforce- am	Motor Officers	Special Units	Sub-Total Field Units	Detectives-Vice Narcotics And Other Units	Parking Representatives	Complaint Desk	Total			Total
							CFS	OV	Desk	
	-	57	10,745	58		1,690	10,110	700	1,690	12,500
	115	108	33,426	244		1,830	31,520	2,150	1,830	35,500
	35	34	13,278	122		2,600	12,050	1,350	2,600	16,000
	<u>150</u>	<u>199</u>	<u>57,449</u>	<u>424</u>		<u>6,120</u>	<u>53,680</u>	<u>4,200</u>	<u>6,120</u>	<u>64,000</u>
	0.2%	0.3%	89.6%	0.7%		9.6%	100%	100%	100%	100%
			→ 2,872	2,118						4,990
			→ 27,825							
	195	-	12,796	-	11,946					24,742
	908	-	3,351	-	-					3,351
	9,351	-	18,830	-	-					18,830
	4,115	-	7,095	-	-					7,095
	70	93	29,233							
			→ 2,672							
			→ 9,471							
	<u>2,842</u>	-	<u>6,496</u>							
	<u>2,912+</u>	<u>93+</u>	<u>48,072</u>							
			15,065							
			could be a significant time requirement							
	<u>2,912+</u>	<u>93+</u>	<u>63,137</u>							

II. MANPOWER AVAILABLE FOR FIELD POLICING FUNCTIONS

A. Available Personnel

These data exclude sergeants and represent the number of sworn personnel on the departmental monthly roster for April and

	<u>Police Agents</u>	<u>Policemen</u>	<u>Policewomen</u>
. Uniform Division	14	83	2
. Special Enforcement Team	<u>1</u>	<u>6</u>	<u>-</u>
	15	89	2
. Less Officers Assigned to Special Details:			
- Warrant Detail		(2)	
- Complaint Desk		(1)	(2)
- Dispatchers		(2)	
- Patrol Services Section	(1)		
- Helicopter	<u>(1)</u>	<u>(6)</u>	<u>-</u>
. Total Available for Field Duty	<u>13</u>	<u>78</u>	<u>-</u>
B. <u>Gross Man Hours Available for Field Duty</u>			
. 13 police agents and 78 policemen x 52 weeks x 40 hours	27,040	162,240	-
C. <u>Man Hours Not Available For Field Duty</u>			
. Vacations	1,816	7,624	-
. Holidays	Paid	Paid	-
. In-service Training	219	1,310	-
. Academy training for new recruits	-	6,224	-
. Sick Leave	645	3,869	-
. Injured officers working but assigned to light duty	-	2,080	-
. Leave of absence for either military duty or education	<u>-</u>	<u>3,120</u>	<u>-</u>
	(2,680)	(24,227)	-
D. <u>Net Man Hours Available for Field Duty</u>	24,360	138,013	-

APPENDIX D-1 (2)

April and October 1971 and averaged.

<u>women</u>	<u>Total</u>	
	99	
	<u>7</u>	
	106	
	(2)	
	(3)	
	(2)	
	(1)	
	<u>(7)</u>	
	91	
	189,280	
	9,440	12.2 days per patrolman based on 1972 policy and existing tenure for personnel. 17.5 days per police agent
	-	Officers are paid an extra day for holidays worked
	1,529	2.1 days per sworn personnel or 16.8 hours
	6,224	Generally, new recruits are shown as available personnel even though in academy training. Academy is 13 weeks or 65 man days. For 1971, 6,224 hours were spent in academy training. Coach-pupil time is not calculated since allowance made for increased workload requirements because of two-man cars.
	4,514	6.2 days per sworn personnel or 49.6 hours
	2,080	Experience indicates one man generally on light duty
	<u>3,120</u>	Experience indicates about 1 1/2 man years lost due to this requirement
	(26,907)	
	162,373	Manpower/availability ratio is 1.63 when the above time off requirements and days off each week are considered.

III. HOW MAN HOURS AVAILABLE FOR FIELD DUTY ARE UTILIZED

	<u>Man Hours</u>	<u>% of Total</u>
A. <u>Net Man Hours Available for Field Duty</u>	162,373	100%
B. <u>Workload and Other Time Usages</u>		
. Called for services and on-view actions	29,233	18.0
. Arrests and Bookings	2,872	1.8
. Reports	9,471	5.8
. Traffic Enforcement	6,496	4.0
. Briefings at beginning of tour of duty	10,220	6.3
. Eating and out of service for patrol	10,220	6.3
. "Code 7" time including equipment collection and gassing cars	5,110	3.1
. Personal Time	5,110	3.1
. Two-man cars for problem areas	15,065	9.3
. Uncommitted time for conspicuous patrol, other crime repression activities and backup	68,576	42.3
	<hr/>	<hr/>
	162,373	100.0%

Comments

With existing field manpower of 91 officers and a manpower/availability ratio of 1.63, about 56 men are available for assignment each day. Based on estimates and interviews, about .5 man hours are spent on briefings per man per tour of duty; .5 man hours for eating; .25 man hours for "Code 7"; and .5 man hours for personal time.

(1) Field Units Handled Almost 90% Of The Department's Caseload And The Complaint Desk Almost 10%

For calendar year 1971, the approximately 64,000 Part I, II, and III offenses or incidents were handled, as follows, by various units on a first response basis:

Handling Unit	Number of Cases			Total	% of Total	Cases per Officer Per Year
	Part I Offenses	Part II Offenses	Part III Incidents			
Policeman (Patrol Team)	10,508	30,145	12,627	53,280	83%	795
Uniformed Agents (Patrol Team)	128	2,672	286	3,086	5%	257
Special Enforcement Team	59	386	296	741	1%	106
Motor Officers	-	115	35	150	-	30
Other Field Units	57	108	34	199	-	-
Detectives, Vice-Narcotics and Other Units	58	244	122	424	1%	-
Complaint Desk	1,690	1,830	2,600	6,120	10%	-
Total	<u>12,500</u>	<u>35,500</u>	<u>16,000</u>	<u>64,000</u>	<u>100%</u>	

Analysis of these caseload data suggests that:

- Field policemen (with an average of 67 officers) functioning as part of patrol teams, still handle the bulk of the department's caseload activities, or about 83% of the cases, at least on a first response basis.
- The complaint desk has been relatively effective in handling close to 10% of the offenses or incidents reported to the police. The complaint desk, which usually is manned with a sergeant or light duty officer and civilian police clerks, generally avoids the need to dispatch a patrol unit for the cases they handle.
- Uniformed agents (with an average of 12 agents), functioning as part of patrol teams, were not significantly involved in most called for services, at least on a first response basis.

- The special enforcement team (consisting of one agent and six policemen) generally has not been committed to called for services but has spent its time on selected crime repression activities. Likewise, motor officers (with an average of five officers) have not been involved in called for services.

(2) Over 6% Of The Cases Handled Were "On-View" And Did Not Involve The Dispatch Of A Field Unit

Of the 64,000 cases handled by the department in 1971, about 4,200 or 6.6% were "on-view" services. These cases were either initiated by the action of an officer in the field or did not go through the dispatching process. The estimated involvement of various units in "on-view" cases was as follows:

Handling Unit	Estimated Number of On-View Cases	% of Total On-View Cases	On-View Cases Per Officer Per Year
Policemen (Patrol Team)	3,130	75%	47
Selective Enforcement Team	508	12	73
Uniformed Agents (Patrol Team) Detectives/Vice Narcotics and Other Units	311	7	26
Other Units	156	4	-
Other Field Units	61	1	-
Motor Officers	27	1	5
		100%	

Analysis of these data suggests that:

- The selective enforcement team (SET) is more involved in "on-view" cases than they are in called for services. Based on the four-week sample and average manpower assignments to these units, the SET handled almost 73 "on-view" cases per officer per year as compared to about 47 for policemen and 26 for uniformed agents.
- The probability of "on-view" cases occurring or being generated between Part I and Part II classifications appears somewhat similar. "On-view" cases constituted about 5.6% of the total Part I offenses and 6.0% of the Part II cases. Slightly over 8% of the Part III

incidents are "on-view" due, in part, to warrant arrests being included in this classification.

(3) Field Policing Forces Handled About 58% Of The Arrests Made

About 5,000 arrests were made in calendar year 1971. The estimated number and percentage of arrests made in response to called for services and on-view actions, by handling unit, were as follows:

Handling Unit	Number of Arrests Resulting From			% of Total Arrests	Arrests Per Officer Per Year		
	CFS	OV	Total		CFS	OV	Total
Policeman (Patrol Team)	1,769	633	2,402	49%	27	9	36
% of Arrests Made by Unit	74%	26%	100%				
% of Total Caseload Either CFS or OV Categories	94%	6%	100%				
Uniformed Agents, SET and Motor Officers	201	269	470	9%	8	11	19
% of Arrests Made by Units	43%	57%	100%				
% of Total Caseload in CFS or OV Categories	78%	22%	100%				
Detectives and Vice-Narcotics	NA	NA	2,118	42%	-	-	-
				100%			

Policemen, functioning as part of patrol teams, made 49% of the arrests; other field units (primarily the SET and motor officers) accounted for 9%; and detective and the vice-narcotic details handled 42%. Analysis of these arrest data suggests:

- The policemen in patrol teams make almost twice as many arrests per officer per year as do uniformed agents and members of the SET and motor details. This higher arrest rate results from the heavy volume of called for services which patrol team policemen handle.
- The probability of an arrest from an on-view case appears much higher than that for a called for service. For example, although on-view cases account for only 6% of a patrol team policeman's caseload, 26% of the arrests made are attributed to on-view actions.

Similarly, although on-view cases account for only 22% of the caseload handled by uniformed agents, SET, and motor officers, 57% of the arrests made result from on-view actions. However, a more precise determination of the nature of on-view cases will be needed before this possible relationship can be considered meaningful.

(4) Field Policing Forces Wrote Reports On Only 58% Of The Cases Handled

The report writing requirements of field policing forces has been reduced considerably by instituting the "incident only report" system as summarized below:

<u>Handling Unit</u>	<u>Number of Non-IRO Reports Written</u>	<u>% of Total Cases Handled By Each Unit</u>	<u>% of Cases Which Were Iro's</u>	<u>Reports Written Per Officer Per Year</u>
Policemen (Patrol Team)	25,905	49%	51%	387
Uniformed Agents	1,193	39%	61%	99
SET and Motor Officers	<u>727</u>	67%	33%	60
	27,825			

As indicated in this table, patrol team policemen have a far heavier report writing requirement (as measured by the reports written per officer per year) than other details since they handle most of the called for services.

(5) The Policemen On Patrol Teams Played A Significant Role In Traffic Enforcement

The estimated traffic enforcement activity of field policing forces, by handling unit, in calendar year 1971 is summarized below. This analysis assumes uniformed agents are not involved to any significant degree in traffic enforcement except for major accident investigation which is accounted for in the previous caseload statistics.

Handling Unit	Parking Citations		Non-Hazardous Citations		Hazardous Citations		Warnings	
	Number	%	Number	%	Number	%	Number	%
Field Policemen (Patrol Teams)	12,465	50%	2,299	69%	9,083	48%	2,845	40%
Activity per Officer per Year	186		34		135		42	
SET	136	1%	144	4%	396	2%	135	2%
Activity per Officer per Year	19		20		56		19	
Motor Officers	195	1%	908	27%	9,351	50%	4,115	58%
Activity per Officer per Year	39		181		1,870		823	
Parking Representatives	11,946	48%						
Activity per representative per year	2,389							
Total	<u>24,742</u>	<u>100%</u>	<u>3,351</u>	<u>100%</u>	<u>18,830</u>	<u>100%</u>	<u>7,095</u>	<u>100%</u>

Analysis of these data suggests the following:

- Policemen on patrol teams have a significant role in traffic enforcement in the issuance of hazardous and non-hazardous citations, 48% and 69% of the volume of this enforcement activity, respectively. They also account for 50% of the parking citations due to the City's restrictions on on-street parking at night.
- The motor unit, a small detail of usually five officers, has the highest activity per officer per year in terms of hazardous and non-hazardous citations as well as estimated warnings given.
- The emphasis within the department is on quality versus quantity traffic enforcement due to the large number of citations issued for hazardous violations.

(6) The Average Time Required To Dispose Of Each Case By Field Officers Was Slightly Over 30 Minutes

Based on the four-week workload survey, the average travel and handling time for various types of offenses or incidents was determined. These time requirements are set forth in Appendix D -2, following this page, and summarized below.

APPENDIX D-2

SUMMARY OF THE TIME REQUIREMENTS FOR TRAVEL AND
CASE HANDLING IN THE CITY OF PASADENA BY TYPE OF INCIDENT
For Calendar Year 1971

Background: Detailed workload data pertaining to the time requirements for field policemen in handling various types of offenses and incidents were collected and analyzed for a consecutive four-week period, September 27 through October 24, 1971. These data were obtained for two purposes: (1) to establish the average time required by field officers for travel (from time of dispatch to arrival of a unit on a called for service) and on the scene case handling (whether in response to a called for service or as a result of an on-view action by an officer); and (2) to provide a data base for estimating the number of Part II offenses and Part III incidents, by type, for calendar year 1971 since the Pasadena Police Department did not have this historical information.

These data were obtained from about 4,900 call slips created in the communications center. The information on these slips was edited for completeness and accuracy, transferred to paper tape and tabulated through the time sharing system used by Pasadena through programs developed by the survey team. It should be noted that the offense or incident classification on call slips does not always represent the final case classification as determined by the Records Bureau. This is particularly true for burglaries which are unduly high for the four-week period surveyed. The caseloads for Part I offenses in calendar year 1971 represent actual volumes as extracted from departmental reports.

APPENDIX D (11)

APPENDIX D-2 (2)

Offense or Incident Classification	Average Time During Four-Week Survey			Caseload During Four-Week Survey		Estimated Caseload for Calendar Year 1971	
	Travel	Handling	Total	Number	%	Number	%
	----- (in minutes) -----						
<u>PART I OFFENSES</u>							
1 Homicide	---	---	---	---	---	16	.02
2A Rape	---	---	---	3	0.6	111	.17
3 Robbery	4.33	24.61	28.94	78	1.60	531	.83
4A Agg. Assault	6.40	37.44	43.84	52	1.07	460	.72
5 Burglary	6.61	22.11	28.72	794	16.29	3700	5.78
6 Theft	10.31	30.77	41.08	412	8.45	6450	10.05
7 Auto Theft	10.54	27.54	38.08	128	2.63	1232	1.93
Average/Total	8.8	27.9	36.7	1467	30.1%	12500	19.5%
<u>PART II OFFENSES</u>							
8 Other Assaults	9.35	33.70	43.05	75	1.54	1050	1.64
9 Arson	3.25	24.50	27.75	6	.12	---	---
10 Forgery & Count.	12.15	28.29	40.44	50	1.03	265	.41
11 Fraud	9.17	37.71	46.88	9	.18	---	---
12 Embezzlement	---	---	---	---	---	---	---
13 Property	6.00	43.00	49.00	2	.04	---	---
14 Vandalism	8.18	21.84	30.02	145	2.98	2160	3.38
15 Weapons	4.46	29.27	33.73	16	.33	---	---
16 Prost. & Com'l Vice	---	---	---	---	---	---	---
17 Sex Offenses	11.38	31.00	42.38	10	.21	---	---
18 Narcotic Drug Laws	7.57	25.28	32.85	43	.88	320	.50
19 Gambling	7.00	6.00	13.00	7	.14	---	---
20 Family/Child Off.	12.00	24.00	36.00	7	.14	---	---
21 Driving under Infl.	9.80	9.22	19.02	20	.41	---	---
22 Liquor Laws	---	---	---	2	.04	---	---
23 Drunkenness	5.29	13.63	18.92	119	2.44	1810	2.83
24 Disorderly Conduct	8.67	14.91	23.58	856	17.57	12590	19.67
25 Vagrancy	---	---	---	---	---	---	---
26A All Other Offenses	7.40	16.08	23.48	204	4.19	3015	4.71
26B Bombs & Explosives	---	---	---	2	.04	---	---
27A Traffic Violations	14.15	23.53	37.68	787	16.16	11560	18.06
27B Other Accidents	24.67	9.33	34.00	7	.41	---	---
28 Juveniles	12.38	27.63	40.01	29	.60	---	---
Part II Offenses Not Otherwise Accounted for						2730	4.30
Average/Total	10.4	19.2	29.6	2425	49.8%	35500	55.5%

APPENDIX D (12)

APPENDIX D-2 (3)

Offense or Incident Classification	Average Time During Four-Week Survey			Caseload During Four-Week Survey		Estimated Caseload for Calendar Year 1971		
	Travel	Handling (In Minutes)	Total	Number	%	Number	%	
<u>PART III INCIDENTS</u>								
31	Property-L&F	8.51	15.73	24.24	110	2.26	1815	2.84
32	Persons-L&F	9.92	28.97	38.89	105	2.16	1725	2.70
33	Casualty	8.57	43.00	51.57	69	1.42	1110	1.73
34	Misc. Public	10.52	17.34	27.86	508	10.43	8280	12.94
35	Correspondence	---	---	---	1	.02	---	---
36	Outside Assistance	8.03	28.79	36.82	87	1.78	1430	2.23
37	Colorado St. Bridge	---	---	---	---	---	---	---
40	Warrant Arrest	4.56	12.13	16.69	99	2.03	1610	2.52
	Part III Incidents Not Otherwise Accounted for						30	.04
	Average/Total	<u>9.8</u>	<u>21.0</u>	<u>30.8</u>	<u>979</u>	<u>20.1%</u>	<u>16000</u>	<u>25.0%</u>
	AVERAGE/TOTAL	<u>9.8</u>	<u>22.2</u>	<u>32.0</u>	<u>4871</u>	<u>100%</u>	<u>64000</u>	<u>100%</u>

Workload Category	Average Disposition Time			Total
	For Travel If	On-Site	On-Site	
	Units Dispatched	If CFS	If OV Case	
		(In Minutes)		
Part I Offenses	8.8	27.9	27.9	36.7
Part II Offenses	10.4	19.2	18.7	29.6
Part III Incidents	<u>9.8</u>	<u>21.0</u>	<u>16.5</u>	<u>30.8</u>
Average	<u>9.8</u>	<u>22.2</u>		<u>32.0</u>

When the travel and handling times are averaged for all types of offenses and incidents, the time requirement approximates 32 minutes.

Analysis of these data suggests the following:

- The travel time (from time of dispatch to arrival of a unit) among Part I, II and III offenses and incidents does not differ appreciably (in the 9 to 10 minute range). A known Part I offense does result in a slightly faster travel response time.
- The average case handling time for a field officer on the scene is highest for Part I offenses (about 28 minutes) and less for Part II offenses (about 19 minutes) and Part III incidents (about 21 minutes).
- If the number of on-view cases increases, the average time to dispose of all cases by field units can decrease since travel time is probably not required and the on-the-scene time is slightly less for these cases, particularly Part III incidents.

(7) The Use Of Two-Man Cars And Backup Increased The Man Hours To Handle Field Workload Requirements Significantly

Analysis of dispatch cards for team patrol cars for a one week period (excluding uniformed agents and sergeants) indicated 35% of these units in the field were two-man cars. It is estimated, therefore, that total man hours required by patrol team policemen to handle workload units is increased by 35%. No allowance was made for the possibility that one man of a two-man unit would write a report while the other was patrolling nor that one man could be a police reserve officer or a new officer in a coach-pupil

arrangement. A similar analysis indicated that about 37% of the special enforcement team (excluding sergeants) were deployed in two-man cars.

Existing data sources do not permit any reliable determination of the time spent by one field unit in support of another. However, interviews with various police personnel and on-site observations indicate this time requirement probably is considerable and, possibly, could be excessive.

(8) A Variety Of Factors Depleted The Manpower And Man Hours Available For Field Policing Functions

For calendar year 1971, it was estimated that about 91 officers (13 police agents and 78 policemen) were available for for field policing functions, excluding field sergeants and officers involved in the helicopter unit, warrant detail, complaint desk, dispatching, and patrol services sections. The gross man hours available for field duty were 189,280 hours (91 officers x 52 weeks x 40 hours) before the following time off requirements were considered:

	<u>Number</u>	<u>% of Total</u>
• Gross man hours available	189,280	100.0%
• Less:		
Vacations	9,441	5.0
Holidays	Paid	-
In-service training	1,529	0.8
Academy training for new recruits	6,224	3.3
Sick leave	4,514	2.4
Injured officers assigned to light duty	2,080	1.1
Leave of absence for military duty of education	3,120	1.6
	<u>(26,907)</u>	<u>14.2%</u>
• Net man hours available for field duty	<u>162,373</u>	<u>85.8%</u>

About 162,373 net man hours were available for field duty, or about 86% of the gross man hours originally available. When these time off requirements are considered as well as normal days off, the assignment/availability factor was 1.63. That is, it required 1.63 officers to provide an average of one officer available for duty each day.

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It should be noted that this assignment/availability factor would be higher if the department did not pay for holidays worked. Also, the cost of the field policing function (as affected by manpower requirements and costs) can be affected, sometimes significantly, by:

- . Policy decisions by the City Council regarding vacations for police personnel as part of their fringe benefit package.
- . Policy decisions concerning the time off which will be allotted to officers for in-service training.
- . The attrition experience of the department which necessitates that new officers be recruited and academy trained.
- . The injury and leave of absence experience of the department.

(9) Approximately 42% Of The Total Man Hours Available For Field Duty Were Uncommitted

For calendar year 1971, estimates were developed, based on the four week survey, on how the available time of field police forces was utilized. This time utilization information is aggregate in nature for the available man hours of policemen and uniformed agents on patrol teams, the SET, motor officers and other special units in the field. Detectives, vice-narcotic units, and the helicopter detail are not considered. Time utilization, by type of usage, is summarized below.

APPENDIX D (16)

<u>How Time Utilized</u>	<u>% of Available Time</u>	
Called for services and on-view actions	18%	
Arrests and bookings	2	
Report writing	<u>6</u>	26%
Traffic Enforcement		4%
Doubling of part of the above workload by using two-man cars in problem areas		<u>9%</u> 39%
Briefings at start of tour of duty	6%	
Eating and out of service for patrol, including equipment collection and gassing cars	9	
Other personal time	<u>3</u>	18%
Uncommitted time for conspicuous patrol, other crime repression activities and backup to other units		<u>42%</u> <u>99%</u>

Analysis of these estimated time utilization data suggests the following:

- At least 39% of the man hours available for field policing are required to handle called for services, arrests and bookings, report writing and traffic enforcement when the use of two-man cars is considered in some areas. From 5% to 10% of these available hours are utilized by officer initiated actions regarding traffic enforcement and on-view activities.
- About 18% of the man hours available for field policing cannot be considered "street" time in the traditional sense. Briefings, eating and other personal time requirements which occur while officers are on duty significantly limit the man hours available for field policing tasks. This 18% figure, which could be considered non-operational time, is closely related to the 15% allowance factor used in industrial engineering studies of field personnel in other public service areas which attempt to establish work output standards. These studies have indicated that only 85% of a standard work day can be considered potentially productive time due to such factors as work instruction, breaks, fatigue and so on.

About 42% of available field time is estimated as uncommitted and available for officer initiated crime repression activities (like conspicuous patrol), stopping suspicious persons, door checks, and so on), as well as backup to other field units. These data provide few insights on how much of this uncommitted time is used or required for backup.

These aggregate time utilization data do not, at this point, consider the following factors:

The distribution of workload among various handling units (like patrol teams and the SET).

Workload fluctuations which occur by day and time of day.

There is a widespread feeling within the Pasadena Police Department that little or no time exists for traditional patrol tasks and that most time is spent answering called for services. This condition certainly does exist for some days, shifts and units on these shifts. However, on an aggregate basis, the workload data developed indicate (at a confidence level of at least 95% and an accuracy of +/- 5%) that in calendar year 1971 uncommitted time of about 40% did exist before backup requirements and unit specialization are considered.

(10) When Workload Was Allocated Among Various Types Of Field Units, The Uncommitted Time Available Ranged From 33% To 73%

For calendar year 1971, the estimated workload of field policing forces was allocated among various types of field units. This allocation is set forth in Appendix D -3, following this page, and summarized below:

<u>Handling Unit</u>	<u>% of Available Time Which Was Uncommitted and Could Be Used for Crime Repression and Backup</u>
Policemen (Patrol Teams)	33%
Motor Officers	48%
Uniformed Agents (Patrol Teams)	70%
SET	73%

APPENDIX D (18)

APPENDIX D-3

ESTIMATED ALLOCATION OF WORKLOAD
 AMONG FIELD PATROL FORCES IN PASADENA
 Calendar Year 1971

I. AVAILABLE FIELD PERSONNEL

Unit	Number of Personnel Assigned			x 2,080 Hours	Gross Man Hours Before Time Off
	Police Agents	Policemen	Total		
Patrol Teams	12	67	79		164,320
SET	1	6	7		14,560
Motors	-	5	5		10,400
	13	78	91		189,280

II. MAN HOURS NOT AVAILABLE FOR FIELD DUTY

	Patrol Teams			PA	SET		Motors PO	Total
	PA	PO	Total		PA	PO		
Gross Man Hours	24,960	139,360	164,320	2,080	12,480	14,560	10,400	189,280
Less:								
Vacations	1,680	6,539	8,219	140	586	726	488	9,433
Holidays	←			Paid →				
Training	202	1,126	1,328	17	101	118	84	1,530
Academy	-	6,224	6,224	-	-	-	-	6,224
Sick Leave	595	3,323	3,918	50	298	348	248	4,514
Light Duty	500	1,100	1,600	-	180	180	300	2,080
Leave of Absence	-	3,120	3,120	-	-	-	-	3,120
	(2,977)	(21,432)	(24,409)	(207)	(1,165)	(1,372)	(1,120)	(26,901)
Net Man Hours Available for Field Duty	21,983	117,928	139,911	1,873	11,315	13,188	9,280	162,379

APPENDIX D (19)

APPENDIX D-3 (2)

III. WORKLOAD REQUIREMENTS BY MAN HOURS

	Patrol Teams			SET			PO	Total
	PA	PO	Total	PA	PO	Total		
Called for Services and On-View Actions	1,493	27,401	28,894	-	-	269	70	29,233
Arrests and Bookings	235	2,402	2,637	-	-	136	99	2,872
Reports	597	8,631	9,228	-	-	140	103	9,471
Traffic Enforcement	-	3,513	3,513	-	-	141	2,842	6,496
Two-man cars	-	14,649	14,649	-	-	416	-	15,065
Backup	Data Not Available But Could Be High							
Sub Total	<u>2,325</u>	<u>56,596</u>	<u>58,921</u>	-	-	<u>1,102</u>	<u>3,114</u>	<u>63,137</u>
Briefings	1,385	7,429	8,814	-	-	831	575	10,220
Eating	1,385	7,429	8,814	-	-	831	575	10,220
Code "7" Time	692	3,715	4,407	-	-	415	288	5,110
Personal Time	692	3,715	4,407	-	-	415	288	5,110
Sub Total	<u>4,154</u>	<u>22,288</u>	<u>26,442</u>	-	-	<u>2,492</u>	<u>1,726</u>	<u>30,660</u>
Uncommitted Time for Conspicuous Patrol, Other Crime Repression and Backup	<u>15,504</u>	<u>39,044</u>	<u>54,548</u>	-	-	<u>9,594</u>	<u>4,440</u>	<u>68,582</u>
As % of Available Time	70.5%	33.1%	39.2%	-	-	72.7%	47.8%	42.2%

APPENDIX D (20)

As indicated in these data, the policemen on patrol teams had an uncommitted time average of only 33% as compared to 70% and 73% for the uniformed agents and SET, respectively.

APPENDIX E

SUMMARY OF RESPONSES TO QUESTIONNAIRE ON FIELD POLICING POLICIES

Background: Questionnaires to obtain data on current practices in the area of field policing services (patrol and traffic enforcement) were sent to 51 police departments in California serving cities in the 50,000 to 150,000 population range. Responses were obtained from 28 departments or 55% of those surveyed. These responses are summarized in the sections below.

1. PERFORMANCE MEASURES NOW USED OR DESIRED TO ASSESS THE ACCOMPLISHMENTS OF FIELD POLICING FORCESA. Current Practices

<u>Performance Measures</u>	<u>Number of Departments Which</u>			<u>Comments</u>
	<u>Regularly Use This Measure</u>	<u>Periodically Use This Measure</u>	<u>Don't Use This Measure</u>	
a. Maintenance of a specific response time to called for services	3	18	7	Periodic sampling of call slips and analysis of officer activity logs generally used to assess response times. Few departments indicate regular collection, analysis and use of response time data. Twenty-two departments provided either actual (usually based upon a sample) or estimated response times. These response times, "averaged," ranged from 4.6 to 5.9 minutes with the lowest being 2 minutes and the highest about 17 minutes. Within these 22 departments, (and using their highest response time if a range was presented) seven indicated response times in the 3.0 to 3.9 minute range, four in the 4.0 to 4.9 minute range, 6 in the 5.0 to 5.9 minute range, one in the 6.0 to 6.9 minute range, and four with response times in excess of 10 minutes. Several departments indicated lower response times for alarms or emergencies than other calls. Five departments indicated they would like to achieve response times in the two to five minute range, at least for emergency calls and incidents in progress. It should be noted that many response times given appear to be estimated data.

<u>Performance Measures</u>	<u>Number of Departments Which</u>			<u>Comments</u>
	<u>Regularly Use This Measure</u>	<u>Periodically Use This Measure</u>	<u>Don't Use This Measure</u>	
b. Maintenance of a specific percent of field time for conspicuous patrol	16	8	4	The percent of uncommitted time for field patrol units to engage in conspicuous patrol appears to be collected and analyzed primarily from officer activity logs. Most departments indicated a real need to have these data available and summarized through automated data processing. Nineteen departments provided either actual or estimated data on conspicuous patrol time expressed as a percentage of total time. These percentages, averaged, ranged from 50% to 53%, with the lowest being about 20% and the highest being about 80%. Within these 19 departments, (and using their lowest patrol time percentage) one indicated patrol time of less than 20%, one in the 20%-29% range, four in the 30% to 39% range, two in the 40%-49% range, four in the 50%-59% range, four in the 60%-69% range, one in the 70%-79% range and two 80% or above. Nine departments indicated they would like to achieve a conspicuous patrol time percentage in the 40% to 80% range with the average desired percentage being 59% to 61%.
c. Maintenance of a specific traffic enforcement index	13	6	9	Eight departments provided data on their current traffic enforcement index. The indices cited ranged from 12.0 to 32.0, with the average being 20.3. The most desired index level cited was 20. One department indicated that although their traffic enforcement has fallen from 14 to 12, the number of injury fatalities has decreased also.
d. Maintenance of a specific arrest rate by field units for reported crimes	3	9	16	Most departments do not use arrests by field officers as a performance measure. There appears some dislike of any standard in this area or a quota system. One department would like to compare field officer arrests with the ten most numerous crimes.

APPENDIX E (3)

Performance Measures	Number of Departments Which			Comments
	Regularly Use This Measure	Periodically Use This Measure	Don't Use This Measure	
e. Maintenance of a specific number of citizen service contacts per field officer	5	7	16	One department compares the number of officer observations per 100 hours worked and another has about two contacts per officer per shift but would like five.
f. Maintenance of a specific number of man years of patrol time for repressible crimes	4	4	20	One department indicated they now have about 22 man years of patrol time for repressible crimes and would like 32 man years. Another department indicated they would like more definitive data on what are considered repressible crimes and what degree of patrol has diminishing returns.
g. Other selected measures now used	(Number of responses not applicable)			
• Ratio of case reports taken to number of calls handled to see if officers take too many or too few reports				
• Use of a grid system (1/4 square mile per grid) to show crime patterns. More than four crimes per month in a grid is considered excessive				
• Officer accident and safety record				
• Number of times the number of patrol units drops below the acceptable level established by the department				
• Observations of supervisors				
• Number of citizen complaints substantiated				
• Patrol miles driven				
• Number of reports taken				
• Absence of complaints from citizens or city management				
• Clearance rate and field arrest of reported crimes				
• Number of self initiated activities				
• Review of officers' and sergeants' daily logs				
• Number of cases handled per officer per shift and number of arrests				

B.	<u>Desired Practices</u>	<u>Number of Departments Which</u>			<u>Total Possible Responses</u>	<u>Comments</u>
		<u>Now Regularly Use This Measure</u>	<u>Would Like to Regularly Use This Measure</u>	<u>Total</u>		
a.	Maintenance of a specific response time to called for services	3	13	16	28	The majority of departments answering these questions indicate that computerized information processing is critical for obtaining and regularly using these various types of performance measures. One department indicated that response times by shift and beat (both for emergencies and less priority services) would be valuable. Another department indicated that citizen contacts should be weighted in terms of their quality.
b.	Maintenance of a specific percent of field time for conspicuous patrol	16	9	25	28	
c.	Maintenance of a specific traffic enforcement index	13	8	21	28	
d.	Maintenance of a specific arrest rate by field units for reported crimes	3	11	14	28	
e.	Maintenance of a specific number of citizen service contacts per field officer	5	8	13	28	
f.	Maintenance of a specific number of man years of patrol time for repressible crimes	4	8	12	28	
g.	Other selected measures which departments would like to use	(Number of responses not applicable)				
	• Average field unit time required for the investigation of all crimes and incidents					
	• Ways to identify and document areas which require patrol services					
	• An automated procedure for predicting the probabilities of certain types of repressible crimes occurring by time and area (now done manually)					
	• Comparison of officer arrests with the ten most numerous crimes					
	• Court conviction rate per arresting officer					
	• Research methodology for determining public needs and attitudes toward the police					
	• Valid means of gathering data on the activities of individual officers					
	• Determination of what officers actually do with patrol time					
	• Determination of what cases should be followed up by detectives or field officers					
	• Why areas have certain crime patterns					
	• Effect which saturation patrol has upon repressible crimes					

2. METHODS NOW USED FOR DETERMINING THE NUMBER OF PATROL UNITS OR LEVEL OF FIELD PATROL SERVICES NEEDED

Basic Approaches Cited	Number of Departments	Comments
a. Consideration of various factors affecting field policing requirements	21	The only common pattern which existed among these 21 departments in determining and documenting their field service levels and manpower needs was an increasing emphasis on workload analysis. Analysis of called for services in terms of growth or time requirements, or both, was the predominant factor in determining patrol unit needs. The increase in Part I crimes and their relationship to existing manpower levels was the second most important factor considered. It also appears that an increasing number of departments are evaluating the amount of uncommitted patrol time available (in either manhours or percentages) as a basis for determining manpower requirements. Other factors considered by departments in assessing manpower requirements for field policing forces cover a wide spectrum. Response time, in particular, was not a dominant factor used in determining service and staffing needs.
. Analysis of called for services	16	One department indicated it would attempt to quantify the results achieved from the amount of time planned for preventative patrol for fiscal year 1972-1973.
. Comparison of crime rates for Part I offenses to staffing	11	Another department indicated it needed policy guidelines from the city council regarding the preventative patrol time, response time and crime rate level desired by the community.
. Analysis of amount of uncommitted patrol time available	7	One department indicated that the controlling factor for determining service and manpower levels was the budget provided to the police department.
. Analysis of population trends	6	Nine departments made specific reference to the amount of time desired for preventative patrol
. Analysis of response times	3	
. Review of arrest workload	3	
. Determination of report writing requirements	3	
. Number of licensed businesses	2	
. Number of residences by types	2	
. Geographical area to be covered	2	
. Number of accidents handled	2	
. Type of beats needed	2	
. Analysis of manpower availability	2	
. Analysis of overtime required because of manpower shortages	2	
. Anticipated college enrollments	1	
. Major events which will occur in the city	1	
. Budget requests of other organization units in the department	1	

Basic Approaches Cited	Number of Departments	Comments
a. Consideration of various factors...		
. Number of preventable crimes occurring	1	
. Cost of protecting each \$100 assessed valuation	1	
. Historical caseloads by time of occurrences	1	
. Number of Part II offenses which are hazards	1	
. Budget available to the police department	1	
. Analysis of miscellaneous services performed	1	
. Analysis of how sworn and non-sworn personnel are utilized	1	
. Amount of traffic enforcement activity	1	
. Amount of community relations activities to be handled by patrol units	1	
b. Comparison of the number of policemen per 1,000 population with previous years and other similar sized cities	3	Most departments keep track of their staffing per 1,000 population and know how they compare with other similar sized cities. However, only three departments indicated that a police staffing to population ratio was used to determine staffing needs.
c. No particular guidelines used or regular analysis performed to document staffing needs	3	Three departments indicated that no systematic analysis was employed to determine service or staffing requirements.
d. Use of manpower allocation method employed by the International Association of Chiefs of Police	1	This approach is based on a computation of arrests, case reports, traffic collisions and miscellaneous activities performed by each watch and the average time to handle all incidents. These data are processed through the IACP formula to determine the number of beats necessary to man one patrol beat on one shift for one year. These data are multiplied by an assignment/availability factor of 1.6 to determine the number of officers needed in the field.
TOTAL	<u>28</u>	

3. STRATEGIES OR APPROACHES NOW EMPLOYED TO PROVIDE AN ADEQUATE LEVEL OF FIELD PATROL SERVICES WITHIN AVAILABLE BUDGETS AS WELL AS CONTROL COSTS

Strategy or Approach	Number of Departments		
	Yes	No	Considering This Approach
	(28 responses possible)		
a. Primary use of one-man patrol units	26	2	None
b. Redistribution of patrol units in accordance with need at least monthly based on regular workload surveys	13	10	5
c. Regular use of a "flying squad" or fourth watch for selective enforcement in high problem or workload areas	16	2	9
d. Use of overtime for off-duty officers to work in heavy workload time periods	11	17	None
e. Use of community services officers (non-sworn) to handle minor complaints	11	12	5
f. Use of light duty officers or non-sworn personnel to screen service requests and take routine or low priority reports by phone	18	7	3
g. Use of dictating equipment or simplified forms to reduce police officer time in report writing	16	6	5
h. Use of police agents (or other senior officer positions) to handle the most complicated, sensitive and demanding police patrol tasks	4	19	5
i. Use of "police teams" in specific geographical or crime problem areas	13	9	5
j. Use of K-9 patrol units for selected policing tasks	8	19	1
k. Use of traffic warnings rather than citations for minor traffic violations	16	9	3
l. Use of police reserve officers to ride with regular patrol officers when two-man cars are required	21	5	2

APPENDIX E (8)

Strategy or Approach	Number of Departments		
	Yes	No	Considering This Approach
m. Transfer of non-police tasks to other more appropriate agencies	18	5	3
n. Regular review and suggested revision of ordinances or statutes pertaining to behavior areas which no longer seem appropriate or cannot be enforced	14	8	5
o. Use of citations in lieu of physical arrests for suspects in minor criminal offenses	23	3	2
p. Use on non-sworn personnel for parking enforcement	18	8	2
q. Elimination of all regular foot patrols	16	8	2
r. Use of a regular staff inspection program to pinpoint problem areas in patrol operations	20	4	3
s. Other strategies	(Number of responses not applicable)		
. Bicycle patrol using plainclothes officers and small portable radios for certain types of crimes			
. Development of a cadet program using part-time college students for certain non-hazardous tasks			
. Use of patrolmen in the investigations division to supplement this area			
. Use of "on-call" for officers subpoenaed to court			
. Use of light duty jobs for injured officers to release an inside and able officer to the field			
. Establishment of a community survey and workshop program to solicit community concerns about police problems through the community relations bureau			
. Use of a special riot squad			
. Patrol by uniformed personnel in unmarked units			
. Establishment of a 4/10 plan with a four-hour overlap during high activity periods			
. Use of explorer scouts for non-police activities and public relations duties			
. Use of traffic units for traffic control now being handled by beat units			
. Changing watch times			
. Handprinting of all but dictated reports			
. Use of "team policing"			

Strategy or Approach	(Number of Responses Not Applicable)
s. Other strategies...	
. Use of "incident only" reports	
. Development of a neighborhood officer team	
. Expanded use of mental health department on family disturbances	
. Regular use of some crime prevention tactics, including crime checks and hazard reports	
. Use of a special enforcement team	
. Use of lesser paid civilians as jailers, property clerks and training coordinators	
. Elimination of specialized traffic accident investigation units by moving this function into the patrol division and utilizing traffic personnel for patrol	
. Videotaping arrestees and on-scene incidents	
. Use of pre-trial hearings by court	
. Specialized training in field patrol areas	
. Crime scene investigation unit within the patrol division	
. Videotaping training at briefings	
. Reorganization of patrol and services divisions	
. Field officer completing investigation when no follow-up by investigators is needed	
. Use of solo motorcycles for selective enforcement	
. Assignment of radar units to high accident locations and problem areas	
. Notice at line-up of specific areas requiring attention	
. Close liaison between traffic engineering and traffic bureau	
. Reporting by officers of unusual conditions, e. g. signs, lights, etc.	
. One team to concentrate on patrol of secondary schools	
. One team to handle patrol follow-up investigations	

4. WAYS IN WHICH DEPARTMENTS HELP TO INSURE THAT THE ROUTINE OR UNCOMMITTED TIME OF FIELD UNITS (TIME NOT SPENT ON CALLS FOR SERVICE, REPORTS AND BOOKINGS) IS USED EFFICIENTLY OR EFFECTIVELY

<u>Method Employed</u>	<u>Number of Departments Using This Approach</u>
. Field supervision	28
. Analysis of the activity logs maintained by field officers	11
. Analysis of computerized activity reports	4
. Analysis of other production reports	3

Comments

Several departments indicate that the assignment of a team to a specific geographical area at a certain time improves the use of patrol time. Another department conducts regular crime studies on patrol preventable crimes (burglary, robbery, auto theft, grand and petty theft, indecent exposure and rape). Based on historical data, the probability of the location and time of occurrence of these crimes are computed and patrol units are deployed to these areas. The detective division reports on the success or failure of these deployments and this time use monthly.

In analyzing patrol unit activity involving uncommitted time, various factors are considered, including:

- . Number of field observations or stops made
- . Number of public relations contacts made
- . Mileage driven
- . Number of reported hazards
- . Number of self-initiated or on-view activities
- . Number of citations given

One department periodically shifts patrol unit assignments to see if activity in the area changes. Some departments indicate that analysis of field interrogation cards helps to spot adequate officer activity.

5. NUMBER OF MAN HOURS PLANNED OR USED EACH YEAR FOR THE TRAINING OF EACH PATROLMAN AND SERGEANT

<u>Department</u>	<u>Reported In-Service Training Hours Annually Per:</u>	
	<u>Patrolman</u>	<u>Field Sergeant</u>
1	242	252
2	233	233
3	192	192
4	185	185
5	173	130
6	167	167
7	160	160
8	7% of Total Working Hours	
9	145	145
10	130	130
11	126	126
12	100	92
13	100	100
14	89	89
15	80	---
16	66	---
17	64	64
18	60	60
19	53	53
20	52	52
21	50	25
22	40	40
23	40	80
24	40	40
25	24	24
26	15	15
Average Hours Provided in 25 Departments	100	93

Two departments provided no answer or indicated no in-service training hours were provided. Reported in-service training hours for some departments probably include all or part of the time spent in watch briefings.

APPENDIX F

DESCRIPTION AND ANALYSIS OF CONTROL
CENTER RESPONSE ACTIVITIES IN
THE CITY OF PASADENA

Control center response activities in the Pasadena Police Department (defined also as the command and control function) can be carried out at either of two locations: (1) the front desk within the police department; or (2) in a separate but nearby building, the communication center.

Both locations are comparably manned and equipped, the front desk and the communication center each have two complaint clerks on duty during the day and evening shifts, and one during the night shift. Both locations have identical radio communications equipment and status boards. The communications center has two dispatchers on duty at all times, a primary dispatcher and a back-up dispatcher. In contrast, the front desk has a desk sergeant to handle the dispatching at that location.

The two areas are linked by an intercom, a pneumatic tube, and a telephone. The intercom is used primarily for emergency situations. The pneumatic tube is used to transmit non-emergency call information from the front desk to the communications center and other non-priority messages between the areas. The telephone is used for non-call for service messages.

Which area handles a call depends on the urgency of the call and what number is dialed by a person requesting police assistance. If the police emergency number is dialed, the call is received by the communications center where both screening and dispatching is done. If the police information number is dialed, the call is received by the front desk. The call is screened there, and, if an emergency, the desk sergeant will immediately dispatch a unit if one is available or alert all units to the emergency situation. All units are alerted in this latter case in the event a unit has forgotten to notify control of its available status and can respond. If the call is not an emergency and through the screening process it has been determined that a unit should be dispatched, the call information is recorded on a dispatch slip and sent to the communications center via the pneumatic tube. The dispatch slip is then taken by the complaint clerk in the center and given to the dispatcher.

In summary, all calls are screened where received which depends on what number is dialed--the information number or emergency number. All emergency calls are dispatched from the area where the call is received. All non-emergency calls are dispatched from the communications center.

An emergency situation is a situation where the police department feels a quick response can be effective in stopping a serious offense and in apprehending the offender. Burglaries and robberies in progress typically are the emergency situations confronting the department. Other offenses, such as assault with a deadly weapon, are considered emergency situations too, but they occur much more infrequently.

It should be noted that burglar alarms do not necessarily represent emergencies to the complaint desk. If the alarm is a "repeater", one that often rings for no apparent reason, it is handled as a non-emergency call. If the alarm, however, is not a repeater but a "new" alarm, it is handled as an emergency call.

Non-emergency calls, as they reach the dispatcher, are subject to the discretion of the dispatcher. There are no established guidelines as to what calls should be given what priority. Mostly, the dispatcher judges the caller's problem and then dispatches units to reduce the number of slow roll complaints.

1. Complaint Section

The main function of the complaint sections, both at the front desk and in the communications center, is to screen incoming calls and dispose of them accordingly.

The types of calls that are received by the complaint clerks are:

- . Emergency requests for aid
- . Non-emergency requests for aid
- . Requests for information
- . Requests for another department
- . Messages to patrolmen in the field

(1) Emergency requests for aid

Emergency calls, calls reporting in-progress offenses of a serious nature, are rare. It is estimated that there are two to three emergency calls per day received by the communications center and maybe one per day at the front desk. These are typically in-progress burglaries and robberies.

(2) Non-emergency requests for aid

Non-emergency calls are all calls that require police action, excluding calls reporting in-progress offenses of a serious nature. There are, on an average, a little over 145 non-emergency calls per day.

(3) Requests for information

Oftentimes a complaint clerk will receive a call requesting only information or advice, the caller not wanting a field officer to respond. When this happens, there is an increased risk of an emergency call suffering a delay due to the complaint clerks being busy. It is for this reason the department has both an emergency number and an information number, hoping callers desiring information will call the information number and not tie up the emergency line. Of course, not much can be done about the emergency caller who dials the information number.

(4) Requests for another department

The complaint clerks also receive "wrong number" calls where the call must be transferred to another department. Those calls generally do not take up much of the clerk's time per call. However, they may interfere with a valid call.

(5) Messages to patrolmen

In addition to all calls generated by the community, there are calls requesting messages be given to the field patrolmen. These requests are made by family members, friends of the patrolmen, and in-the-station patrolmen. Many of these messages are personal messages; some are work related.

The screening process determines if the call is an emergency, so that the dispatcher can be notified immediately and units requested to roll. As other vital information is received, it is then passed on to the units responding.

If the call is not an emergency, then the clerk determines if it is a police or civil matter, and if a police matter, whether a field unit should be dispatched. If a unit is to be dispatched, a dispatch slip is completed and placed on a conveyor to the dispatchers.

It has been estimated that each complaint clerk receives between 70 and 90 calls per shift.

2. Dispatch Section

The dispatch section at the front desk primarily monitors the dispatching activities of the communications center. For the most part, the only dispatching conducted at the front desk is the dispatching of emergency calls received at the desk. This does not constitute a very heavy workload, and certainly not a significant portion of the total dispatching workload.

The dispatch section in the communications center, for all practical purposes, handles the entire dispatching workload. The activities handled include:

- . Emergency and non-emergency calls for service
 - . Warrant checks requested by officers in the field
 - . Messages to and from officers in the field
- (1) Emergency and non-emergency calls for service

The dispatching of emergency and non-emergency calls for service consists of the transmission of all information about the call, possible retransmission of information not copied, and change of status, e.g. arrived at the scene, completed detail.

- (2) Warrant check requests by officers in the field

When an officer in the field wants a warrant check, he radios the dispatcher. The dispatcher must then punch the necessary information into the remote terminal located alongside the communications console and radio back the terminal's response.

- (3) Messages to and from officers in the field

The dispatchers also are requested to relay messages to and from field officers. These messages are frequently not work-related but personal.

There are two dispatchers assigned to each shift: a primary dispatcher and a back-up dispatcher. The primary dispatcher has the ultimate responsibility to dispatch all calls, and when he can, run warrant checks.

The back-up dispatcher on some occasions dispatches calls when the primary dispatcher is burdened with calls. However, he primarily coordinates with other police agencies by phone during pursuits, etc., calls

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The back-up dispatcher on some occasions dispatches calls when the primary dispatcher is burdened with calls. However, he primarily coordinates with other police agencies by phone during pursuits, etc., calls

for auto tows when needed, keeps up status board, and runs warrant checks. In addition, he assumes the primary dispatching responsibilities when the primary dispatcher is on break so that there is a dispatcher on duty at all times.

3. Communications

There are two radio channels for communication. The main channel, termed "Frequency One", is used for most call dispatching and for warrant checks whenever the channel is not busy with dispatching activities. The secondary channel, "Frequency Two", is used to dispatch calls whenever the main channel becomes heavily loaded. It is also used for warrant checks whenever "Frequency One" is busy and for all personal messages.

The operating procedure is to use "Frequency One" for call dispatching as much as possible because field units are tuned to this channel. Whenever it becomes necessary to use "Frequency Two" to dispatch a call or to run a warrant check or whenever a personal message is to be transmitted, the selected units are alerted to switch to "Frequency Two". When the transmissions over this channel are completed the communications center's end of the transmission is handled by the back-up dispatcher; the units switch back to "Frequency One".

The two channels are obviously not operated independently of each other. The secondary channel is used in a back-up and personal services role. But before this channel can be used, units must be informed over the main channel that the transmissions will be made over "Frequency Two".

4. The Call Process

Calls for service are treated as either emergency or non-emergency calls. As indicated earlier, emergency calls are defined as in-progress calls of a serious nature. However, what an emergency call really means to the police department is that a quick response to the call may result in the apprehension of the offender.

Emergency calls are given top priority which results in different response procedures within the control center for the two types of calls.

(1) Emergency call

Who handles an emergency call is determined by where it is received, either at the front desk (the information number) or in the communication center (the emergency number). The processing activities and time efforts for emergency calls are summarized on the following page:

Communications Center

<u>Activity</u>	<u>Time</u>
(1) Complaint clerk answers phone and determines whether the call is an emergency	5 - 10 seconds
(2) Complaint clerk notifies desk sergeant (dispatcher) so that he can, in turn, alert units	5 - 10 seconds
(3) Desk sergeant (dispatcher) alerts units, giving them the address or location of the emergency	10 - 15 seconds

The above activities constitute the activities that must be done in sequence before a unit (or units) begins to roll to the scene, but before a unit arrives to handle the call he should receive additional information regarding the nature of the emergency. After the complaint clerk notifies the desk sergeant of the emergency call, he then takes down additional, vital call information, and gives this to the desk sergeant. The desk sergeant, in turn, transmits this to the detailed cars. This information should be received by the responding units before they arrive on the scene. (It is assumed that this is always the case.)

From the time estimates given above, the total control center response time for emergency calls is estimated to be between 20 and 35 seconds. However, the response time will be greater if any of the following delays are experienced:

Delay due to busy complaint clerks: If the call comes in when all the clerks are busy, then there will be a delay in responding to the incoming call. This delay can be held to a minimum if the clerk, whenever a call comes in, would interrupt any non-emergency activity and check to see whether the call is an emergency. Of course, if a clerk is involved in an emergency call he could not check on the incoming call. However, it is highly unlikely that an emergency call would be called in while another is being handled, and it is even less likely that all the complaint clerks would be each handling an emergency call.

Delay due to busy dispatcher: A dispatcher completes the dispatching of a message, regardless of its urgency, before he begins to dispatch another. Therefore, if the call reaches him while he is dispatching a message the call will suffer some delay. However, since the time to transmit a message is, at most, 20 seconds, the expected delay of this type is somewhat less than 20 seconds.

If the delay is experienced, it will be experienced regardless of where the call is received. This is because the two facilities, front desk and communications center, both use the same communications channel for dispatching, and therefore, when one is dispatching a message the other must still wait.

Delay due to busy field units: The most often cited, and probably the most significant, delay is that due to all the field units being busy when the call is to be assigned. If all units are busy, as determined by the status boards, all units are alerted to the emergency situation. This is done so that delay is not incurred just because a unit failed to notify the department, for one reason or another, of its available status and so that units who could complete their assignments early do so in order to take the new call.

(2) Non-emergency call

The handling of a non-emergency call depends on where it is received. The process is essentially the same regardless of where it is received, except that all information received at the desk is sent to the communications center.

The activities and time estimates for the handling of a non-emergency call are given on the following page.

Front Desk

<u>Activity</u>	<u>Time Estimate</u>
(1) Complaint desk receives call and fills out dispatch slip	3 - 5 minutes
(2) Complaint clerk puts slip in tube carrier	10 - 15 seconds
(3) Pneumatic tube carries dispatch slip to communications center	40 seconds
(4) Complaint clerk in communications center removes dispatch slip from tube carrier and places slip on conveyor	10 - 15 seconds
(5) Conveyor carries dispatch slip to dispatcher	nil
(6) Dispatcher assigns call to available units	10 - 20 seconds

These activities are all sequential. The estimated time for the process is between 4 and 6-1/2 minutes, if each activity is begun immediately upon completion of the preceding activity. If, however, each activity cannot begin as it should in the sequence, the time will be greater.

Possible delays are:

Delay due to busy complaint clerks (at the desk)

This delay is much the same as the delay that could be experienced in handling an emergency call. The difference is that the call must wait for an available clerk.

Delay due to busy clerks (in the communications center)

For a call received at the front desk, there may also be delay due to the complaint clerks in the communications department being busy. The dispatch slip sent through the pneumatic tube must be taken from the tube carrier and placed on the conveyor. If the clerks are too busy to do this then the slip remains in the tube carrier and the call is delayed.

Delay due to busy dispatcher

This delay is the same that could be experienced in the handling of an emergency call.

Delay due to busy field units

If all field units are unavailable when a call is to be assigned, the assignment must wait until a unit becomes available. For this type of call, no alert message is transmitted.

This delay is sensitive to both type of call and location. The dispatcher, if he has more than one call to assign, will queue each according to his perception of the call's urgency. Also, a dispatcher will assign calls according to location. For example, a call may be delayed because all units in that area are busy even though there may be an available unit in an adjacent area.

The processing of non-emergency calls in the communications center is summarized below:

<u>Communications Center</u>	
<u>Activity</u>	<u>Time Estimate</u>
(1) Complaint clerk receives call and fills out dispatch slip	3 - 5 minutes
(2) Complaint clerk places slip on conveyor	nil
(3) Conveyor carries slip to dispatcher	nil
(4) Dispatcher assigns call to available units	10 - 20 seconds

The estimated average time for the above activities is 3 to 5 minutes. When the call time is considered, the dispatching time is insignificant.

The delays possible in handling a call received in the communications center are the same as those possible in handling a call received at the front desk except for one. Since the dispatch slip is not handled a second time by a complaint clerk, no delay of this type is possible.

APPENDIX G

EXPLANATION OF THE QUEUING AND
AVERAGE TRAVEL DISTANCE MODELS

This appendix provides an explanation of: (1) how a classical queuing model can be used to estimate the average delay time per call for the situations where calls are received at random and detailed to field units as the units become available; and (2) how the average travel distance of field units responding to calls can be estimated.

1. Use of the Queuing Model in Determining Average Response Time Delays

A queuing model can be used to estimate the average delay (or wait) due to field unit unavailability. To make these estimates, the following basic steps must be taken:

- . The demand, or average number of calls per hour (or any other time period) must be determined.
- . The capacity, or number of field units available for duty and responding to calls by time of day, must be established.
- . The average service time for disposing of each call must be calculated (for travel, on-site handling, and arrest and report writing, if needed). The periods defined by capacity and demand rate changes must be determined.
- . For each period, the workload per hour must be determined by multiplying the number of calls (demand) per hour in the period by the average service time per call.
- . For each period, the utilization factor of available field units must be determined by dividing the workload per hour by the number of field units available (capacity) in the period.
- . For each period, the delay factor must be determined by referencing a standard delay table using known capacity and utilization factors.

APPENDIX G (2)

- . For each period, the average delay per call (in minutes) must be calculated by multiplying the average service time by the delay factor.
- . For each period, the total estimated delay in minutes must be determined by multiplying the average delay per call by the number of calls received during that time period.
- . The average delay over all periods must be determined by totalling the delay in each period and then dividing this total by the total number of calls.

To illustrate the use of this queuing model in estimating average delay times due to field unit unavailability, three examples are presented in the sections below:

(1) Example 1 - Service demand rates and handling capacities are constant

This example (which is not particularly realistic) assumes that the average demand rate (the number of calls for service per hour) is constant and that there is the same number of field units on duty at all times.

If the average service time per call is .8 man hours, the rate of calls for service is 8.75 calls per hour, and the number of field units on duty is 10, then the average delay is determined as follows:

- . Determine the number of man hours of work per hour

The average service time per call times the number of calls per hour equals the man hours of work per hour. In this case it is:

$$8.75 \text{ calls per hour} \times .8 \text{ hours per call} = 7 \text{ man hours}$$

Determine the utilization factor

The utilization factor is simply the number of man hours of work required of each unit per hour. This is calculated by dividing the total number of man hours of work per hour by the number of field units on duty. In this example, the utilization factor is $7 \div 10$ or .70.

Obviously, a unit cannot perform more than one man hour of work per hour, and therefore, if the utilization factor exceeds 1.00, demand exceeds capacity.

Determine the delay factor

The delay factor is a normalized factor relating utilization and capacity to average delay. This factor is obtained from Appendix G-1, following this page, a standard delay table, by selecting the number in the column corresponding to the proper capacity and across from the calculated utilization factor. In the example, where capacity is 10 ($C = 10$) and the utilization factor is .70, the delay factor is 7.3910E-02.

The numbers in the table are presented in this format for convenience. To convert this to the common decimal expression, simply place the decimal point the proper number or digits to the left or right as indicated by the "E-field". The "E-field" for this number is "E-02" which means that the decimal point must be placed two positions (as indicated by "02") to the left (as indicated by the "-"). The decimal number is then .073910.

A blank where the "-" appears would indicate the decimal point should be placed the proper number of positions to the right.

Determine the average delay

The average delay is calculated by multiplying the average service time by the delay factor. In this case, the average service time is .8 hour or 48 minutes. The average delay is then $48 \times .073910$ or 3.55 minutes. This means that each call waits to be dispatched, on the average, 3.55 minutes due to field units being busy on other calls.

DELAY TABLE

APPENDIX G-1

UTILIZATION
FACTOR

DELAY FACTOR

	C = 1	C = 2	C = 3	C = 4	C = 5	C = 6	C = 7	C = 8	C = 9	C = 10	C = 11
0.05	5.2632E-02	2.5063E-03	1.7882E-04	1.5120E-05							
0.10	1.1111E-01	1.0101E-02	1.3717E-03	2.2068E-04	3.9000E-05						
0.15	1.7647E-01	2.3018E-02	4.4655E-03	1.0253E-03	2.5857E-04	6.9225E-05	1.9317E-05				
0.20	2.5000E-01	4.1667E-02	1.0274E-02	2.9940E-03	9.5785E-04	3.2527E-04	1.1512E-04	4.2004E-05	1.5687E-05		
0.25	3.3333E-01	6.6667E-02	1.9608E-02	6.8027E-03	2.5891E-03	1.0457E-03	4.4010E-04	1.9094E-04	8.4790E-05	3.8351E-05	1.7607E-05
0.30	4.2857E-01	9.8901E-02	3.3347E-02	1.3232E-02	5.7541E-03	2.6539E-03	1.2753E-03	6.3167E-04	3.2021E-04	1.6533E-04	8.6641E-05
0.35	5.3846E-01	1.3960E-01	5.2524E-02	2.3194E-02	1.1210E-02	5.7428E-03	3.0641E-03	1.6847E-03	9.4793E-04	5.4321E-04	3.1594E-04
0.40	6.6667E-01	1.9048E-01	7.8431E-02	3.7792E-02	1.9903E-02	1.1093E-02	6.4427E-03	3.8531E-03	2.3577E-03	1.4691E-03	9.2905E-04
0.45	8.1818E-01	2.5392E-01	1.1277E-01	5.8424E-02	3.3022E-02	1.9746E-02	1.2284E-02	7.8687E-03	5.1558E-03	3.4396E-03	2.3284E-03
0.50	1.0000E 00	3.3333E-01	1.5789E-01	8.6957E-02	5.2149E-02	3.3048E-02	2.1771E-02	1.4761E-02	1.0233E-02	7.2211E-03	5.1697E-03
0.55	1.2222E 00	4.3369E-01	2.1716E-01	1.2600E-01	7.9449E-02	5.2870E-02	3.6542E-02	2.5977E-02	1.8874E-02	1.3953E-02	1.0462E-02
0.60	1.5000E 00	5.6250E-01	2.9562E-01	1.7940E-01	1.1803E-01	8.1903E-02	5.8948E-02	4.3607E-02	3.2951E-02	2.5325E-02	1.9735E-02
0.65	1.8571E 00	7.3160E-01	4.0118E-01	2.5316E-01	1.7289E-01	1.2425E-01	9.2563E-02	7.0819E-02	5.5312E-02	4.3918E-02	3.5345E-02
0.70	2.3333E 00	9.6078E-01	5.4705E-01	3.5721E-01	2.5189E-01	1.8665E-01	1.4321E-01	1.1275E-01	9.0563E-02	7.3910E-02	6.1111E-02
0.75	3.0000E 00	1.2857E 00	7.5701E-01	5.0343E-01	3.6943E-01	2.8110E-01	2.2122E-01	1.7849E-01	1.4682E-01	1.2264E-01	1.0374E-01
0.80	4.0000E 00	1.7778E 00	1.0787E 00	7.4554E-01	5.5411E-01	4.3148E-01	3.4710E-01	2.8603E-01	2.4012E-01	2.0459E-01	1.7643E-01
0.85	5.6667E 00	2.6036E 00	1.6231E 00	1.1489E 00	8.7263E-01	6.9339E-01	5.6856E-01	4.0764E-01	4.0764E-01	3.5324E-01	3.0966E-01
0.90	9.0000E 00	4.2632E 00	2.7235E 00	1.9694E 00	1.5250E 00	1.2335E 00	1.0285E 00	8.7692E-01	7.6059E-01	6.6373E-01	5.9450E-01
0.95	1.9000E 01	9.2564E 00	6.0467E 00	4.4571E 00	3.5112E 00	2.8853E 00	2.4413E 00	2.1104E 00	1.8546E 00	1.6512E 00	1.4356E 00
	C = 12	C = 13	C = 14	C = 15	C = 16	C = 17	C = 18	C = 19	C = 20	C = 21	C = 22
0.30	4.5967E-05	2.4642E-05	1.3327E-05								
0.35	1.8603E-04	1.1067E-04	6.6424E-05	4.0172E-05	2.4456E-05	1.4976E-05					
0.40	5.9475E-04	3.8468E-04	2.5101E-04	1.6503E-04	1.0323E-04	7.2713E-05	4.8656E-05	3.2709E-05	2.2379E-05	1.4960E-05	1.0170E-05
0.45	1.5355E-03	1.1045E-03	7.7135E-04	5.4273E-04	3.8444E-04	2.7389E-04	1.9613E-04	1.4110E-04	1.0193E-04	7.3905E-05	5.3769E-05
0.50	3.7457E-03	2.7416E-03	2.0241E-03	1.5057E-03	1.1274E-03	8.4838E-04	6.4263E-04	4.8866E-04	3.7311E-04	2.8595E-04	2.1989E-04
0.55	7.9361E-03	6.0333E-03	4.7019E-03	3.6611E-03	2.8692E-03	2.2615E-03	1.7916E-03	1.4257E-03	1.1392E-03	9.1367E-04	7.3523E-04
0.60	1.5558E-02	1.2385E-02	9.9418E-03	8.0390E-03	6.5417E-03	5.3533E-03	4.4027E-03	3.6372E-03	3.0163E-03	2.5114E-03	2.0976E-03
0.65	2.8766E-02	2.3635E-02	1.9578E-02	1.6333E-02	1.3710E-02	1.1572E-02	9.8153E-03	8.3615E-03	7.1513E-03	6.1380E-03	5.2855E-03
0.70	5.1080E-02	4.3090E-02	3.6638E-02	3.1367E-02	2.7016E-02	2.3392E-02	2.0351E-02	1.7780E-02	1.5594E-02	1.3724E-02	1.2116E-02
0.75	8.8678E-02	7.6475E-02	6.6455E-02	5.8130E-02	5.1143E-02	4.5227E-02	4.0173E-02	3.5838E-02	3.2086E-02		
0.80	1.5368E-01	1.3501E-01	1.1948E-01	1.0640E-01	9.5276E-02	8.5737E-02	7.7489E-02	7.0309E-02	6.4019E-02	5.8479E-02	5.3574E-02
0.85	2.7409E-01	2.4456E-01	2.1974E-01	1.9364E-01	1.8051E-01	1.6480E-01	1.5108E-01	1.3902E-01	1.2835E-01	1.1886E-01	1.1038E-01
0.90	5.3337E-01	4.8224E-01	4.3890E-01	4.0175E-01	3.6959E-01	3.4150E-01	3.1679E-01	2.9490E-01	2.7538E-01	2.5790E-01	2.4215E-01
0.95	1.3484E 00	1.2328E 00	1.1343E 00	1.0493E 00	9.7524E-01	9.1020E-01	8.5264E-01	8.0136E-01	7.5540E-01	7.1399E-01	6.7648E-01

Most likely the delay factor will not be obtained quite so easily. An additional step is necessary if the utilization factor is not one of the numbers given in the table but falls between two of them, for example, a utilization factor of .68 or .72. When this situation arises the delay factor is obtained through the process of interpolation.

This process is illustrated in the following examples:

- Find the delay factor corresponding to a utilization factor of .68 and capacity of 10 (C = 10)

Delay factors are given for utilization factors .65 and .70. They are 4.3918E-02 and 7.3910E-02 respectively. The delay factor is obtained by assuming that it is between the two given delay factors in the same proportion .68 is between .65 and .70.

The calculations then are as follows:

$$\text{proportion factor} = \frac{.68 - .65}{.70 - .65} = \frac{.03}{.05} = .6$$

$$\text{delay factor increment} = .6 \times (7.3910\text{E-}02 - 4.3918\text{E-}02)$$

$$= .6 \times 2.9992\text{E-}02$$

$$= 1.7995\text{E-}02$$

$$\begin{aligned} \text{delay factor} &= 4.3918\text{E-}02 + 1.7995\text{E-}02 \\ &= 6.1913\text{E-}02 \text{ or } .061913 \end{aligned}$$

When adding or subtracting delay factors (or delay factor increments) the expressions must be of the same rank as determined by the "E-field". For example, 1.0000E-02 when added to 2.0000E-01 is not equal to 3.000E-02 or 3.0000E-01.

Either of the expressions must be changed to the rank of the other before adding or subtracting the two. The expression 1.0000E-02 if changed to .10000E-01 can now be added to 2.0000E-01 as they are both of the same rank. (The resultant sum is 2.1000E-01.)

It may be easier (or less confusing), however, to change the delay factors into their decimal expressions before any mathematical operations are performed, as done in the next example.

- Find the delay factor corresponding to a utilization factor of .72 and capacity of 10 (C = 10)

Delay factors are given for utilization factors .70 and .75. They are, in their decimal forms, .073910 and .12264 respectively.

The calculations for determining the delay factor are:

$$\text{proportion factor} = \frac{.72 - .70}{.75 - .70} = \frac{.02}{.05} = .4$$

$$\begin{aligned} \text{delay factor increment} &= .4 \times (.12264 - .073910) \\ &= .4 \times .04873 \\ &= .01949 \end{aligned}$$

$$\begin{aligned} \text{delay factor} &= .073910 + .01949 \\ &= .09340 \end{aligned}$$

- (2) Example 2 - Fluctuating service demand rates and changing capacities but no dispatching restrictions

Example 1 illustrated how to calculate the average delay per call for a given demand rate, capacity and average service time. However, typically, demand rates change during the day and different numbers of field units are deployed during various time periods to cope with this changing demand. Since the average delay per call is a function of demand rate and capacity (and average service time which will be assumed the same for all situations) and since the only convenient method for estimating average delay assumes constant demand rate and capacity, the procedure illustrated in example 1 must be modified to estimate average delay for the case of fluctuating demand rates and changing capacities.

The procedure described below initially divides the day into periods to reflect significant differences in the demand rates. The average delay in each period, as defined by the demand rate and capacity, is then determined in the same manner as used in example 1. The average delay over the day is calculated from the number of calls in each period and the average delay for the period.

This procedure is more fully described in the following steps:

Determine the number of field units in the field by time of day

The number of field units in the field is generally scheduled, and, therefore, should be easily determined from the standard deployment schedule. There are two important factors, however, that must be considered with respect to this schedule. They are:

- The schedule often indicates the time a shift or team comes on duty and goes off. Since the number of units in the field is the important consideration, the schedule may have to be modified (to exclude briefing, equipment collection, and gas up time) in determining the actual number of units in the field.
- The schedule may indicate only the number of patrolmen assigned to duty and not the number of units in the field. The one-man and two-man patrol unit mix must be considered to arrive at the number of field units represented by the regularly assigned patrolmen.

In Pasadena, the basic deployment practice was found in the Team Schedule. This schedule blocks off the time each team is on duty. However, since approximately the first hour of each shift is spent in briefing, equipment collection, and gas up, the team is not actually deployed during this hour period. Using the shortened time blocks and team manning practices, the actual deployed manpower over a 24-hour period is determined.

As agents and field sergeants do not normally respond to calls for service on a first response basis (except for traffic accidents), only patrolmen were considered to represent field units (or field capacities). Furthermore, since approximately 35% of all patrolmen in Pasadena are in two-man units, each patrolman represents only $\frac{1}{1.35}$ or .74 field units. The number of field units deployed over the day (call capacities) can then be determined by converting patrolmen into field units using this patrolman to field unit ratio. This then is the capacity as it changes during the day.

. Determine the demand (or call for service) rate by time of day

Demand, the number of calls for service received, typically varies significantly over a 24-hour period. It is essential for deployment and scheduling purposes to know how this demand varies during a day.

In the response time analysis presented in Chapter IV, the number of calls for service (demand) requiring dispatch of a field unit were based on active call volume and distribution in the months of April and November, 1971. Only a block of 28 days was used in each month to include the proper number of weekends and mid-week periods in the sample. The sample was further segregated into 48 one-half hour periods. An average of the two months' activity for each one-half hour period was taken and then divided by 28, yielding a typical day's call for service activity in each one-half hour segment of the day.

. Determine the periods in which each day should be classified for further queuing analysis

As a starting point in determining the periods for further queuing analysis, the periods defined by the field unit deployment plan can be used. The beginning of a period, and the end of its predecessor are clearly identifiable whenever there is a change in the field unit deployment. The situations that would signify the beginning of a new period are listed below:

- Additional units are deployed. This may be the start of a shift under the "5-8 plan" or of one or more team shifts under any of the various team plans.
- Some of the units complete their shift and are removed from the field.
- Some (or all) of the units finish their shift and other units begin their shift. This may not result in a net change in the number of units in the field, but it defines another period which may prove useful in response time analysis.

To finalize the periods for use in further queuing analysis it is important to examine the rate of calls for service in one-half hour segments for each of these defined periods. If there exists a significant difference in the rate of calls for service in the beginning and end of any period, then the period should be further divided into two more periods.

The next step is to calculate, on a per hour basis, the call for service rate for each of the periods defined at this point.

The third step is to examine the periods to determine if any two adjacent periods have the same number of field units deployed. If two periods like this exist and their call for service rate is approximately the same, they can be combined into a single period.

It should be noted that if the purpose was to determine the best deployment pattern to minimize average delay rather than estimating average delay for an existing deployment pattern, the procedure would be reversed. The periods would first be defined by the variations in call for service rate and then the deployment would be designed around these periods to minimize or equalize dispatching delays.

. Determine the average delay per call in each period

Once the periods for queuing analysis have been defined by the capacity levels and call for service rates, the average delay per call in each period can be calculated. One of two methods is used to make these computations: (1) a delay table; or (2) an alternative method.

The delay table method is the same procedure described in example 1. The workload per hour and utilization in the period is calculated from the capacity, call for service rate and average service time; the delay factor is then obtained from the delay table; and finally, the average delay is calculated from the average service time and the delay factor.

An alternate method is used for periods where there is a sharp but temporary increase in the call for service rate compared to the capacity (or utilization) and calculates an upper limit to the average delay for the period. This is done by assuming that all calls received in the period are received at its beginning and that all field units remaining from the preceding period had been detailed calls at the very end of that period. Therefore, all calls received in the present period (received at the beginning) must wait the average service time. When the field units complete the details received during the preceding period, they can then begin to handle the waiting calls. If there are more calls waiting than there are units on duty, the extra calls must wait another average service time or until additional field units are deployed (the next period), whichever is shorter. This waiting continues until all calls have been handled or the period ends.

The upper limit of average delay is calculated by simply totalling the delay for all calls in the period and dividing by the number of calls. However, since this is only the upper limit of the average delay, the actual average should be something less than this. The rule of thumb approach is to assume the average delay is one-half of its upper limit.

The algorithm for the alternate method and two examples illustrating the application of this method are given below.

Alternate Method Algorithm

Step 1: If the time remaining in the period (P-T) is less than the average service time (AST) go to Step 4, otherwise continue.

Step 2: Calculate the contribution to delay time (D) by multiplying the number of cases waiting to be handled (C-H) by the average service time.

$$D = (C-H) \times \text{AST}$$

C represents the total number of cases received in the period and H, the number of cases handled so far in the period.

Step 3: Increase the number of cases handled (H) by the number of units in the field (U).

$$H' = H + U$$

Increase the amount of time passed in the period (T) by the average service time (AST).

$$T' = T + \text{AST}$$

Go to Step 1

The purpose of this step is to update the number of cases handled in the period and the amount of time passed in the period. The H'(T') on the left side of the equation takes on the value of the previous H (T) plus the value of U (AST). In essence, the value of H (T) has been increased by the value of U (AST).

Step 4: Calculate the last delay contribution by multiplying the number of cases still waiting to be handled (C-H) by the time remaining in the period (P-T).

$$D = (C-H) \times (P-T)$$

Step 5: Total the delay contributions

$$TD = D + D + D + \dots$$

Step 6: Calculate the upper limit of average delay (LAD) by dividing the total delay (TD) by the number of calls (C).

$$LAD = \frac{TD}{C}$$

Step 7: Calculate the average delay (AD) by dividing the upper limit by 2.

$$AD = \frac{LAD}{2}$$

- Example A:

Find the average delay in a period one hour in duration where 7.38 calls will be received in the period, 48 minutes is the average service time, and 6 field units are on duty.

$$\begin{aligned} \text{Total delay (TD)} &= 7.38 \times 48 + [(7.38 - 6) \times (60 - 48)] \\ &= 370.80 \text{ minutes} \end{aligned}$$

$$\text{Limit of average delay (LAD)} = \frac{370.80}{7.38} = 50.24 \text{ minutes}$$

$$\text{Average delay (AD)} = \frac{50.24}{2} = 25.12 \text{ minutes}$$

- Example B:

Find the average delay in a period two and one-half hours in duration when 5.99 calls will be received in the period, 48 minutes is the average service time, and 2 field units are on duty.

$$\begin{aligned} \text{Total delay (TD)} &= (5.99 \times 48) + [(5.99 - 2) \times 48] \\ &\quad + [(5.99 - 4) \times 48] \\ &= 287.52 + 191.52 + 95.52 \\ &= 574.56 \text{ minutes} \end{aligned}$$

$$\text{Limit of average delay (LAD)} = \frac{574.56}{5.99} = 95.92 \text{ minutes}$$

$$\text{Average delay (AD)} = \frac{95.92}{2} = 47.96 \text{ minutes}$$

The problem in estimating average delay is to determine which method--the delay table method or the alternate method--should be used in each of the periods. This selection is based on equilibrium considerations, more specifically whether:

- Equilibrium is reached in the period and if so, when.

Equilibrium, a condition where, although fluctuations in the average delay occur for the short period, the average delay is relatively constant for the long period, is a fundamental assumption required for use of the delay table method in estimating average delay.

For an accurate estimate, equilibrium must be reached early in the period so that the resultant error when equilibrium is assumed for the entire period is insignificant. When either capacity or demand rate changes, some time will elapse before equilibrium is again established. This time is determined primarily by the change in the "before and after" average delays under equilibrium conditions. The greater the change in the equilibrium average delay, the greater will be the elapsed or transient period. Of course, even if the change in average delay is great, if the period is long with respect to the average delay, equilibrium can be assumed with little error in the estimate.

- Equilibrium is possible.

If, for any of the established periods, the utilization of the service facility (field units) is calculated to be greater than unity (demand exceeds capacity), then equilibrium cannot exist. The average delay will increase as the condition is allowed to continue. The delay table method cannot be used under these conditions as it has a required assumption of equilibrium.

If this condition exists for only a short time, and the average delays in the preceding and succeeding periods are low, then the alternate method for calculating average delay will provide a reasonable estimate. However, the longer the period and the greater the delay of the preceding and succeeding periods, the greater will be the error in the estimate.

Guidelines for selecting which method to use are summarized as follows:

- When the average delay per call calculated using the delay table method is less than 10% of the period duration, use the delay table method.
- When the average delay per call calculated using the delay table method is greater than 10% of the period duration but does not differ by more than 25% from average delay calculated per call for the preceding and succeeding periods, use the delay table method.
- Use the lesser of the two estimates obtained from the delay table method and alternate method for all other cases.

Calculate the average delay over all periods

The calculation of average delay over all periods is relatively simple. To accomplish this, first calculate the delay contribution in each period. This involves multiplying the number of calls in the period times the average delay for the calls in the period. Second, total the delay contributions from each period and divide by the total number of calls.

The procedure described in example 2 is presented in Appendix G-2, following this page, and summarized below:

- Define the periods based on the number of units in the field and the call for service rate during the day. Enter this information in Column 1.
- From the call for service sample used in the above step, calculate the number of calls in each period. Enter this in Column 2.
- Calculate the number of calls per hour for each period. This is calculated by dividing the number of calls in the period (Column 2) by the length of the period (Column 1). For example, the length of period 1 is 2.5 hours. This divided into 11.13, the number of calls for the period, equals 4.45, the number of calls per hour for that period. Enter this information in Column 3.

APPENDIX G-2

ESTIMATES OF DISPATCHING DELAY DUE TO UNIT
UNAVAILABILITY IN PASADENA FOR CALENDAR YEAR 1971
SAMPLE DATA IF CITYWIDE DISPATCHING FLEXIBILITY WAS USED
(with .73 hour average service time)

	(1) Period	(2) Number of Calls	(3) Calls Per Hour	(4) Number Of Units	(5) Workload Per Hour ⁽¹⁾	(6) Utilization Factor	(7) Delay Factor	(8) Average Delay (In Minutes)	(9) Total Delay
1.	12:30-3:00	11.13	4.45	10	3.25	.325	.000355	.016	.178
2.	3:00-7:00	9.43	2.11	6	1.54	.257	.00127	.056	.472
3.	7:00-9:30	13.84	5.54	12	4.04	.337	.000150	.007	.097
4.	9:30-10:30	6.95	6.95	6	5.07	.845	.667	23.00 ⁽²⁾	159.850
5.	10:30-3:30	36.11	7.22	11	5.27	.479	.00398	.174	6.283
6.	3:30-6:00	23.95	9.58	11	6.99	.635	.0307	1.34	32.093
7.	6:00-7:30	11.56	7.71	16	5.63	.352	.0000278	.001	.011
8.	7:30-12:30	33.45	6.69	10	4.88	.488	.00631	.277	9.266

← Total Delay = 208.25 minutes

← Average Delay = $208.25 \div 145.42 = 1.43$
minutes per call

If period 4 is excluded,

← Total Delay = 48.40 minutes

← Average Delay = $48.40 \div 138.47 = .350$
minutes per call

(1) Average service time per call computed as .73 hour

(2) The steady state average delay is 29.22 using the delay table method. However, because of the short length of this period, the alternate method of calculation was used.

- . Enter in Column 4 the number of field units in the field during each period as determined from the deployment schedule and modified to reflect actual field unit availability.
- . Calculate the workload per hour in each period by multiplying the calls per hour (Column 3) by the average service time. For example, the calls per hour in period 1 is 4.45. This multiplied by .73 hours, the average service time for the case considered, yields 3.25 man hours of work per hour. Enter this information in Column 5.
- . Calculate the utilization factor for each period. The workload per hour (Column 5) divided by the number of units (Column 6) yields this factor. For period 1, it is 3.25 divided by 10 or .325. Enter this information in Column 6.
- . Determine the delay factor from the delay table (refer to example 1). For period 1, it is .000355. Enter this information in Column 7. Note, if the utilization factor is greater than unity (demand exceeds capacity), no delay factor is calculated. Actually, with the delay table provided, if the utilization factor is greater than .95, no delay factor can be calculated and, instead, the alternative method must be used.
- . Calculate the average delay for each period. The method used to calculate this delay depends on conditions presented earlier. Again, they are:
 - If no delay factor could be calculated then the alternate method is used. In the case used in this illustration, delay factors were calculated for all periods. Therefore, the alternate method was not initially selected.
 - If the average delay calculated using the delay table method is less than 10% of the period duration, use this estimate. This condition is satisfied throughout except for period 4.

- If the average delay calculated using the delay table method is greater than 10% of the period duration but does not differ by more than 25% from the average delay calculated for the preceding and succeeding periods, use this estimate. This condition is not found for any of the periods in the example presented.
- For all other cases, use the lesser of the two estimates obtained from the delay table method and alternate method. In period 4, the delay table method resulted in an average delay of 29.22 minutes. The alternate method, however, yielded an average delay of 23.00 minutes, so this was selected.

Enter the appropriate average delay for each period in Column 8.

- . Calculate the total delay contribution from each period. The average delay (Column 8) times the number of calls in the period (Column 2) yields this value. For period 1, it is $11.13 \times .016$ or .178 minutes. Enter this in the last column, (Column 9).
- . Total the delay contributions from each period to obtain the total delay. For the example referred to in this illustration, the total delay is 208.25 minutes.
- . Calculate the average delay by dividing the total delay by the total number of cases. In this case, it is 208.25 minutes divided by 145.52 cases or 1.43 minutes per call for service.

(3) Example 3 - Fluctuating demand rate and changing capacities with dispatching restrictions

Example 2 demonstrated how to calculate the estimated average delay for a specific geographical area where any field unit in the area could be dispatched to a called for service. If dispatching restrictions are imposed so that only units in the same area as the called for service can be dispatched to the call, then the procedure for estimating delay due to unit unavailability must be modified.

In essence, dispatching restrictions, if based on geography, divide a city like Pasadena into smaller areas. If patrol units, for example, are assigned to specific quadrants in the city and dispatching is restricted to units within the quadrant where the call occurs, the areas, as far as calculating average delay is concerned, is divided into four separate and independent areas. Similarly, if a dispatching restriction dictates that only units in the northern half of the area can be dispatched to calls in that half and only units in the southern half can be dispatched to calls in the southern half, the area becomes two smaller, separate and independent areas.

The procedure for determining the average delay under specific geographic dispatching restrictions is described below:

. Determine the number of field units in each area within a city by time of day

The number of field units deployed overall generally is scheduled. However, the number of units in each geographical area within a city may not be clearly known. If they are, the procedure for determining the number of field units is simple (see example 2). If not, the units must be allocated to each of the geographical areas.

If call for service activity in each area by time of day can be determined. This field unit allocation can be based on the distribution of call for service activity. If the call activity cannot be identified by geographical area, then it must be assumed that it is evenly distributed over all areas and that units are allocated on this same basis. For example, if similar call for service activity is assumed for all geographical areas throughout the day, if there are four areas (or quadrants), and if, for a particular period, 10 units are deployed, then it is estimated that two units are deployed in each of two quadrants and three units in each of the other two quadrants. If, on the other hand, 12 units were available for deployment, these three units would be allocated to each of the four quadrants. In any case, the number of field units must be allocated to each of the geographical areas by time of day.

It should be noted that the same factors mentioned in example 2 regarding actual deployment time and unit availability must also be considered here in determining the actual deployment schedule.

. Determine the demand (call for service) rate by time of day for each geographical area

This calculation is similar to the procedure described in example 2. In fact, if call for service activity cannot be identified by area, it is the same with the modification that once the overall call for service activity is determined, it is apportioned among the geographical areas. This apportioning can be done on the basis of the size of the geographic area, population, or some other demographic parameter. For this example (using Pasadena data) the call for service activity is apportioned on the basis of geographic area, assuming each quadrant or half is equal in area. Consequently, each quadrant is estimated to have one-fourth (or each half, one-half) of the total city's call for service activity.

. Determine the periods in which each day should be classified for further queuing analysis

This is done the same way as described in example 2.

. Determine the average delay per call in each area in each period

This is done the same way as described in example 2, only it must be done separately for each quadrant.

. Calculate the delay in each period

This is a departure from the procedure described in example 2 and caused by the fact that there is more than one area to be considered. If each quadrant (or half) had the same call for service activity and field unit deployment, then their average delays, and hence, total delays in each period would be the same. The average delay for the total area would be the same as for any quadrant (or half) and only the average delay for this smaller area would need to be calculated. However, since call for service activity and field unit deployment is not identical for all areas, an extra step must be taken.

For each period, the total delay in each geographical area is calculated by multiplying the number of calls expected in each area by the average delay for calls in that area. The delay for the period is then calculated by summing the delay in each area.

. Calculate the average delay over all periods

This operation is identical to the one described in example 2.

The overall procedure described in example 3 is presented in Appendix G-3 and summarized below:

- . Define the periods based on the number of units in the field and the call for service activity during the day. Enter this information in Column 1.
- . From the call for service sample, calculate the number of calls in each area in each period. If calls for service cannot be identified with each area, the activity must be apportioned. In this case, the calls were divided equally among the quadrants. This information is entered in Column 2.
- . Calculate the calls per hour in each area in each period. This is done for any area by dividing the number of calls in the period by the duration of the period. For example, in period 1 the number of calls per hour in each quadrant is 2.78 divided by 2.5 or 1.11 calls per hour. This information is entered in Column 3.
- . Determine the number of field units deployed in each area in each period. This was not possible for the case presented. However, the total number of units deployed (all areas) in each period was determined. The units were then distributed among the areas. Since the areas could only have the same number of deployed units if the total number deployed was a multiple of four, there were several periods where quadrants had different numbers of units deployed. This resulted in two types of quadrants being defined-- Type A and Type B--representing the different numbers of units deployed in the quadrants. The number of units deployed in each type of quadrant in each period is entered in Columns 4 and 10.

- . Calculate the workload per hour in each type of quadrant in each period. This is calculated by multiplying the number of calls per hour in each type of quadrant in each period (in this case, Column 3) times the average service time. For period 1, this is 1.11 times .73 or .810 man hours per hour. Since the call for service workload is divided equally among the quadrants, the workload per hour is the same for both types of quadrants. This information is entered in Columns 5 and 11.
- . Calculate the utilization factor, delay factor, average delay and total delay in each type of quadrant in each period. This is done exactly the same way for each type of quadrant as was done in the procedure described in example 2. This information is entered in the proper columns.
- . Calculate the total delay in each period by totalling the delay in each area in each period. Since the call for service activity and field unit deployment may be different for individual areas, the average delay, and, hence, total delay in each area may be different. Therefore, it is necessary to calculate the total delay in each period by totalling the delay in each area.

For the case presented, two types of quadrants are identified, each representing a different number of deployed field units. (Only one type is identified if all quadrants have the same number of deployed field units.) Therefore, the number of quadrants of each type must be determined for each period and then, based on the number of each type and the delay in each, the total delay for the period is calculated.

Referring to Appendix G-3, the steps involved are:

- Enter the total number of units deployed by period in Column 16.
- Enter the number of units deployed in each quadrant type in Columns 17 and 18.
- Determine the number of quadrants of each type in each period and enter this in Columns 19 and 21.

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Period	Number of Calls per Quadrant	Number of Calls per Quadrant Per Hour	Number of Units	Workload ⁽¹⁾ Per Hour	Utilization Factor	Delay Factor	Average Delay (minutes)	Total Delay	Number Of Units	Workload Per Hour	Utilization Factor
1. 12:30-3:00	2.78	1.11	2	.810	.405	.197	8.63	23.99	3	.810	.270
2. 3:00-7:00	2.11	.528	1	.385	.385	.628	27.51	58.05	2	.385	.193
3. 7:00-9:30	3.46	1.38	3	1.01	.337	.0475	2.08	7.20	-		
4. 9:30-10:30	1.74	1.74	1	1.27	1.27		25.34 ⁽²⁾	44.09	2	1.27	.635
5. 10:30-3:30	9.03	1.81	2	1.32	.660	.777	34.03	307.29	3	1.32	.440
6. 3:30-6:00	5.99	2.40	2	1.75	.875		43.76 ⁽²⁾	262.12	3	1.75	.583
7. 6:00-7:30	2.89	1.93	4	1.41	.353	.0241	1.06	3.06	-		
8. 7:30-12:30	8.36	1.67	2	1.22	.610	.596	26.10	218.20	3	1.22	.407

(1) Average service time per call computed as .73 man hours

(2) Alternative method of computing average delay used

APPENDIX G-3

ESTIMATES OF DISPATCHING DELAY DUE TO UNIT UNAVAILABILITY IN
PASADENA FOR 1971 SAMPLE DATA IF QUADRANT DISPATCHING USED

(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)
Delay Factor	Average Delay (minutes)	Total Delay	Total Number Of Units	Number in Each 'A' Quadrant	No. in Each 'B' Quadrant	Number of 'A' Quadrants	Delay in Each 'A'	Number of 'B' Quadrants	Delay in Each 'B'	'A' Delay	'B' Delay	Total Delay
.0251	1.10	3.06	10	2	3	2	23.99	2	3.06	47.98	6.12	54.10
.0391	1.71	3.61	6	1	2	2	58.05	2	3.61	116.10	7.22	123.32
			12	3	-	4	7.20	-	-	28.80	-	28.80
.681	29.83	51.90	6	1	2	2	44.09	2	51.90	88.18	103.80	191.98
.106	4.64	41.90	11	2	3	1	307.29	3	41.90	307.29	125.70	432.99
.269	11.78	70.56	11	2	3	1	262.12	3	70.56	262.12	211.68	473.80
			16	4	-	4	3.06	-	-	12.24	-	12.24
.0832	3.64	30.43	10	2	3	2	218.20	2	30.43	436.40	60.86	497.26

Total Delay = 1,814.49 minutes
Average Delay = $1,814.49 \div 145.42$
= 12.48 minutes

- Enter the delay calculated for each quadrant type in each period (Columns 9 and 15 and Columns 20 and 22).
- Calculate the total delay in the period represented by the "A" and "B" type quadrants. This is calculated by multiplying the number of "A" quadrants (Column 19) by the delay in each "A" quadrant (Column 23) and the number of "B" quadrants (Column 21) by the delay in each "B" quadrant (Column 22). For example, in period 1, there are two "A" quadrants and the delay in each "A" quadrant is 23.99 minutes. Therefore, the delay due to "A" quadrants is 2×23.99 or 47.98 minutes. The delay due to "B" quadrants is 2×3.06 or 6.12 minutes. In period 3, all quadrants have the same number of deployed units. Therefore, only one quadrant type is identified. The total "A" and "B" quadrant delay for each period is entered in Columns 23 and 24, respectively.

The total delay in each period is now calculated by simply adding the "A" type and "B" type delay. The results are entered in Column 25. For example, in period 1, the "A" delay is 47.98 minutes; the "B" delay is 6.12 minutes; and the total delay is 47.98 plus 6.12 or 54.10 minutes.

- . Calculate the average delay. The average delay is calculated by totalling the delay in each period (Column 25) and then dividing by the total number of calls in all periods. For the case presented, the total delay is 1,814.49 minutes. This, divided by the number of calls, 145.42, yields 12.48 minutes of delay per call.
- . Only the case of the total area divided into quadrants is presented here. The procedure for any other division is analogous and it is hoped the reader will not have any appreciable difficulty in adapting the procedure.

2. Determination of the Average Distance Travelled by a Field Unit in Response to a Call for Service

When a field unit is dispatched to a call, the distance it must travel depends on where it is when dispatched and the call location. Another, but not so obvious, factor is the orientation of the streets on which the unit can travel. For example, if the streets are oriented only north-south and east-west and a field unit must travel northeast, then it cannot take the "line of sight" route which is the shortest. However, if streets also were oriented in a northeast-southwest direction, travel distance would approach the "line of sight" distance. Another factor also to consider is natural and manmade barriers, such as rivers and streams, hills, freeways, railroads and malls.

The problem is to determine the average travel distance of a field unit in response to several calls, not just the travel distance in response to a single call. Statistically, the average travel distance for several calls approaches the expected travel distance for a single call. In fact, the more calls on which the average distance is calculated, the less will be the difference between the average and expected distances. So, the problem becomes that of determining the expected travel distance of a field unit in response to a call for service.

The expected travel distance is determined, for the most part, by the following factors:

- . The shape and size of the area.
- . The street layout.
- . Barriers, both natural and manmade.
- . The randomness of where calls for service occur. The more concentrated the calls are in an area, the less will be the expected travel distance if field units are deployed on this basis.
- . The randomness of the field unit's location when dispatched. For any given size and shape of an area and call for service distribution, there will be a point in the area which would provide the shortest expected travel distance if the field units were to wait for a detail at that point. Complete randomness assumes that the location of units in the area is not known so that the closest unit can be detailed--and that units are detailed only on the basis of their availability.

- . Knowledge of the location of field units before dispatch. If the location of the field units is known, then the closest available unit could be detailed the call. For the situation where calls are backlogged, this will not reduce the expected travel distance as, generally, the first available unit will be detailed the call without concern for its location.

The assumptions on which the theoretical model for determining expected travel distance are as follows:

- . The shape of the area is rectangular.
- . The streets are laid out in a quadrille manner.
- . Calls for service occur at random throughout the area. A call is equally likely to occur at any point in the area.
- . The field unit's location before dispatch is random. The unit is equally likely to be at any place in the area while waiting for a detail.

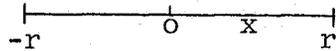
The procedure is to determine the expression for the expected travel distance as a function of the field unit's position and then, using this expression, determine the expression for expected travel distances.

Because calls for service occur randomly throughout the area, travel is only along orthogonal streets and the area is rectangular, the expected travel distances in the north-south direction and in the east-west direction are mutually independent. This allows the problem to be reduced to finding the expected travel distance along each axis.

Since the problems of finding the expected travel distance along each axis are identical, the solutions will also be identical. Therefore, it will suffice to find a general solution for the expected travel distance along only one axis. The expected travel distance along the other axis can easily be determined from the general expression and the total expected travel distances easily determined by adding the two.

Based on the uniform distribution of calls along the axis and using the labeling in the figure below, the expression for the expected travel distance $E(D/X)$ along the axis is:

$$E(D/X) = \left[\frac{r-x}{r} \right] \cdot \left[\frac{r-x}{2} \right] + x$$



The expected travel distance $E(D)$ when the randomness of both call generation and field unit location are considered is expressed below:

$$E(D) = \int f(x) E(D/X) dx$$

where $E(D)$ = expected travel distance
 $f(x)$ = probability distribution function of the location of the field units
 $E(D/X)$ = expected travel distance as a function of position

When the expressions for $E(D/X)$ and $f(x)$ are substituted, the above equation becomes:

$$E(D) = \int_0^r \frac{1}{r} \left[\left(\frac{r-x}{r} \right) \left(\frac{r-x}{2} \right) + x \right] dx$$

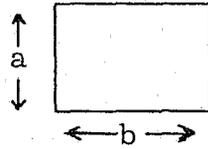
This reduces to:

$$E(D) = \frac{2}{3} r$$

The expected travel distance along an axis $2r$ in length is then $\frac{2}{3} r$. If the axis is alternatively dimensioned "a" then the expected travel distance is $\frac{1}{3} a$.

Since, as was stated earlier, the expected travel distance in a rectangular area (under the assumptions previously made) is simply the sum of the expected travel distances along each axis (north-south and east-west), the expected travel distance is one-third the length plus one-third the width of the area.

If the area is defined as in the figure below:



the expression for expected travel distances is:

$$E(D) = \frac{1}{3} a + \frac{1}{3} b$$

It is interesting to note that the expected travel in a rectangularly shaped area which is equal to that of a square is greater than that for the square area. For example, if a patrol sector 4 miles by 4 miles (16 square miles) is roughly the shape of a square, the expected travel distance would be:

$$E(D) = \frac{1}{3} a + \frac{1}{3} b$$

$$E(D) = \frac{4}{3} + \frac{4}{3}$$

$$E(D) = \frac{8}{3}$$

$$E(D) = 2 \frac{2}{3} \text{ miles}$$

If, however, a patrol sector of about 16 square miles is not shaped like a square and is roughly 2 miles by 8 miles, the expected travel distance would be:

$$E(D) = \frac{2}{3} + \frac{8}{3}$$

$$E(D) = \frac{10}{3}$$

$$E(D) = 3 \frac{1}{3} \text{ miles}$$

APPENDIX H

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