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PLANNING PROGRAMMING BUDGETING STUDY
OF THE CITY OF WINTER PARK

BY

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B.M.E., POLYTECHNIC INSTITUTE OF BROOKLYN, 1957

RESEARCH REPORT

Submitted in partial fulfillment of the requirements
for the degree of Master of Science in
Environmental Systems Management

Orlando, Florida
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PLANNING PROGRAMMING BUDGETING STUDY
OF THE CITY OF WINTER PARK

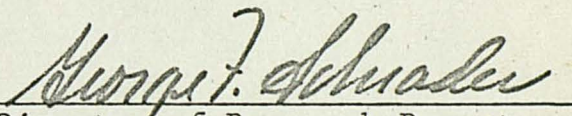
Alfred T. Sawicki

ABSTRACT

The report examines the applicability of Planning, Programming, and Budgeting System to the City of Winter Park. After briefly describing the character of the city, the goals are identified, the means by which they may be achieved and measures of evaluating progress toward them are given.

To show how such an effort might be implemented, specific programs, objectives and effectiveness criteria are provided. These are followed by three examples in which the existing system is described and from which problems are revealed. Next, a brief analysis is performed to pinpoint the difficulty and a solution is proposed. The examples are chosen to illustrate a qualitative problem involving the organizational structure of the government, the next problem is more quantitative yet involves qualitative factors to arrive at a final solution, while the third example is entirely quantitative in nature.

Approved by


Director of Research Report

ACKNOWLEDGEMENTS

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CHAPTER I

CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS

1. A study of part of the City of Winter Park government revealed it to be an orderly, effective and economical operation with some organizational and personnel problems. The report showed the multiplicity of Borads, Commissions and Committees resulted in a cumbersome organization, confusing to the public and difficult to keep up with from a management point of view. In regard to the personnel problems, the quantitative solution to one such problem was not meant to infer that the others could be solved that way. Perhaps the most important point to be made was that the solution included cost-benefit tradeoffs to both the management and employees. The optimal solution fortuitously turned out to be the same for both parties.

2. The most important problem confronting the Fire Department is its precarious ability to respond to and combat large fires at the west end of the city. The monetary impact of the Winter Park Mall fire in 1969 was so severe it caused the average annual loss over a ten year period to soar from \$28,800 to \$309,000.

3. The present records kept by the Fire Department could be adapted for use in a Planning Programming Budgeting system as shown in the report. The chapter on the Fire Department indicates that the first step, describing the present operation, often leads to the identification of hitherto unnoticed problems. Next, the impact of problems is assessed

using various effectiveness criteria and when ambiguous answers occur, they may be resolved by investigating still another criterion. For instance, one might question the rationale behind ever increasing projections of Fire Department budgets and per capita costs, yet, when the fact that fires per capita and the value of property exposed to fires are also increasing at a high rate, the projections appear more reasonable.

4. The spending for the Fire Control Program is more than double that of the Fire Prevention Program. In this context, the question of whether the return would be greater had more support been given the latter program, that is, how much would have been saved in the Mall fire given that a strong prevention program was in being. To answer this, the City Commissioners would need to have the recommendations of the Fire Department and a more comprehensive analysis.

RECOMMENDATIONS

1. The City Commissioners should revise the organizational structure of the government along functional lines and consolidate many of the Boards and Commissions.

2. A comprehensive study needs to be made of the personnel relationships in city government, first to identify key problem areas and then analyze them with cost-benefit assessments which fairly consider management's and the employee view points.

3. The need for an additional fire station on the west end of the city should be studied to determine whether it is justified. If not justified, means to improve access to the Headquarters Unit or to incorporate effective fire prevention measures must be taken.

4. The reason for the increase in number of fires per capita should be analyzed to determine whether a strengthened fire prevention program would stop or even reverse this trend. It seems reasonable that relatively small expenditures here could yield large reductions in fire losses and perhaps a reduction in the Fire Control Program costs.

CHAPTER II

INTRODUCTION

General

The Planning Programming and Budgeting System (PPBS) is a modern, goal oriented, management technique that was first utilized by federal government. (1) It is characterized by statements of explicit goals of the organization, the costs to achieve them and measures of how well each portion of governmental body performs. (2)

As a management tool, PPBS serves several functions. It facilitates comparisons to be made of dissimilar programs because each program has specific goals, budgets and standards of performance. With this information, management can ascertain the degree to which its objectives have been satisfied. If performance is satisfactory, it is easy to justify a similar budget allocation for the following year. Conversely, the budgets for lagging programs can be increased or those of overproductive or of non-productive programs can be reduced to maintain a desired overall level of cost and performance. Another function PPBS provides is an increase in the visibility of governmental operations which helps minimize duplicative and counterproductive efforts between agencies as well as identifying tasks of little consequence to the community. Moreover, by tying objectives together, costs and program performance, PPBS constrains the governmental body to work as a team toward a common goal.

Purpose

The purpose of a PPBS for the city of Winter Park is to identify the goals the administration wishes to pursue, the means by which goals may be achieved and techniques to measure performance. (3) The first step is to state concisely community goals such that they are compatible with those of the state and of the nation. Second, the programs needed to accomplish these goals must be established and for each, a set of objectives prepared. Third, to measure the degree to which the objectives are fulfilled, it is necessary to leave criteria by which they will be judged. Finally, data must be gathered in order that quantitative analysis can be performed to reveal whether proper budget allocations are being made and, if not, to determine the nature and extent of changes or to suggest reasonable alternatives.

Scope

The scope of this report is limited, by time and manpower, to the development of a methodology for implementing a Planning Programming Budgeting System for the city of Winter Park. The methodology is meant to be an evolutionary step toward PPBS rather than a sudden shift into a new and unfamiliar management system. This approach seeks to avoid the traumatic effects of sudden and often misunderstood changes in policy that can easily cripple an otherwise good program. (4)

The report presents a cross-section of city government beginning at the top with a proposed reorganization of some governing bodies, followed by changes in the techniques of measuring the performance of a department and, finally, a tradeoff analysis whereby the costs and benefits of alternate employment systems are analyzed. In each instance,

the present and proposed methods and structures are shown to be similar (in the functional sense) and utilize existing data. Thus, if the city government wishes to apply part or all of the methodology, these examples should be adequate as a guide for other departments and analyses.

CHAPTER III

COMMUNITY GOALS AND OBJECTIVES

The city of Winter Park is a small municipality occupying an area of about eight (8) square miles and containing Rollins College, Winter Park Memorial Hospital, eight (8) schools and sixteen (16) churches. It is primarily a residential community having little commercial and industrial activity so that employment and business opportunities exist mainly in adjacent municipalities and the unincorporated areas of Orange and Seminole Counties. For the foreseeable future, the residential character of the city is not likely to change since it discourages significant commercial development.

The population of the city of Winter Park has increased over the past decade about as fast as the general expansion in central Florida. However, the city's rapid growth is not likely to continue since the amount of exploitable land is rapidly disappearing as are opportunities for annexation. The city has little opportunity to expand to the south, west and north due to its proximity to cities such as Orlando, Eatonville and Maitland. The only open area to the east includes State Road 436 which seems to be a logical boundary to further expansion there. As a result, population growth is likely to reach a saturation value of perhaps 30,500, based on the following analysis.

The population of the city of Winter Park, as determined by the U. S. Bureau of the Census, is shown in Table 1 for the years of 1900 through 1970. (5,6) Also shown are computed population figures from

1940 through 2000 for purposes of comparison.

TABLE 1
POPULATION OF WINTER PARK 1900 - 2000

YEAR	POPULATION	
	ACTUAL	COMPUTED
1900	636	
1910	570	
1920	1,079	
1930	3,686	
1940	4,715	4,300
1950	8,219	8,970
1960	17,162	15,620
1970	21,895	22,200
1980		26,600
1990		28,900
2000		29,900

The record of population increase, shown in Figure 1, appears to be "S" shaped and resembles a logistic growth curve having the following form: (7)

$$y = L / (1 + m e^{-nt})$$

where,

y = population at time t,

$$L = \text{limiting population} = (2y_0y_1y_2 - y_1^2(y_0+y_2)) / (y_0y_2 - y_1^2)$$

and where subscripts 0, 1, 2, 0 0 0 refer to time periods t_0 ,

t_1, t_2, \dots ,

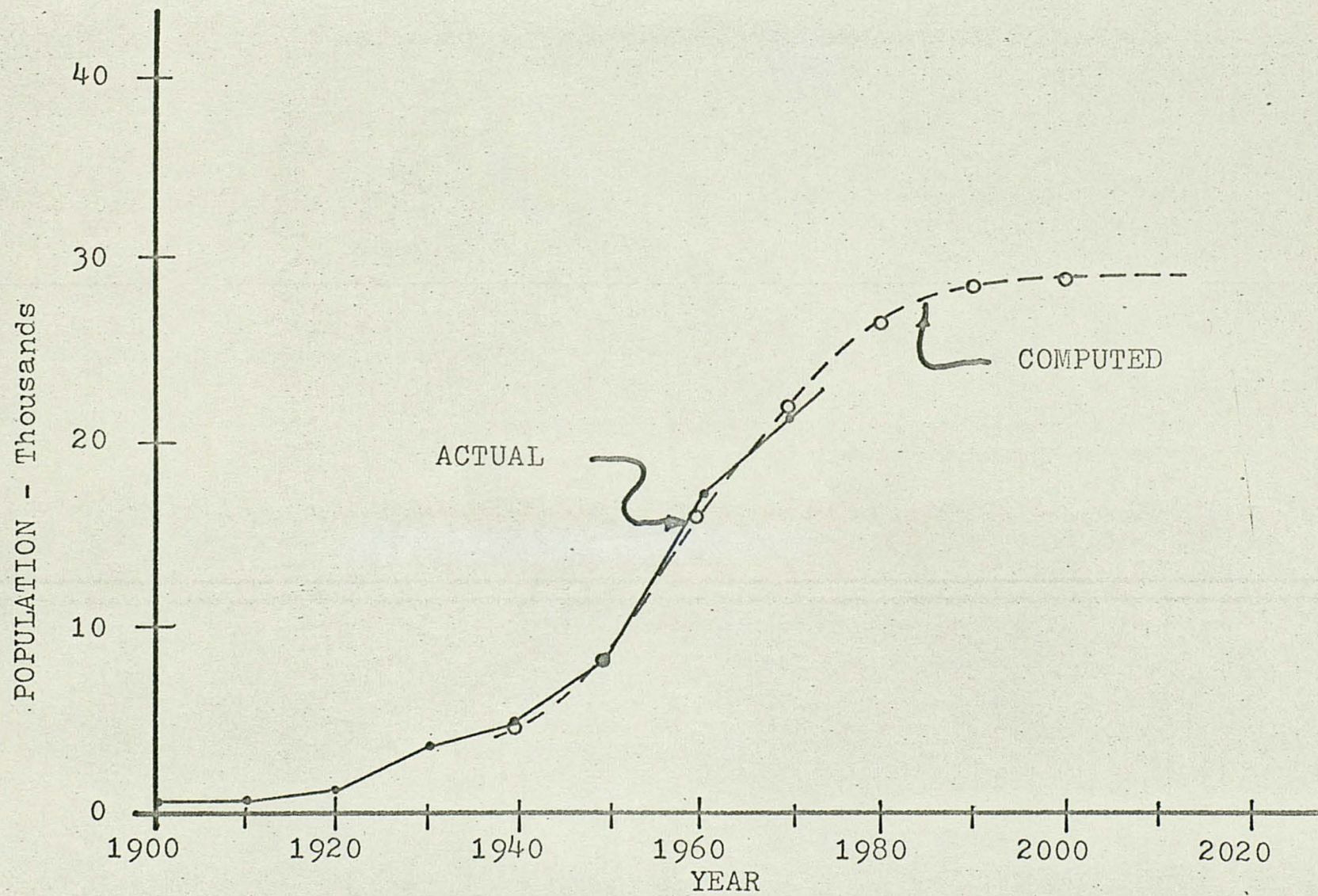


FIG. 1 - POPULATION OF WINTER PARK, 1900 - 2000

$$m = (L - y_0) / y_0, \text{ and}$$

$$n = (1/t_1) \ln((y_0 L - y_0 y_1) / (y_1 L - y_1 y_0))$$

Using the above formulations and census data for 1930, 1950 and 1970, a limiting population value of 30,500 is obtained. Then, using data for 1940, 1950, 1960, and 1970, we obtain the computed population data in the table from the following relationship:

$$y = 30,500 / (1 - 6.1 e^{-.093t})$$

The computed values appear reasonable since they are within 10% of the actual census figure through 1970 and they are thought to be realistic at least through 1980 as well.

The constraints on its geographical location and size and the resultant limitations on population and business growth suggest the goals of Winter Park will be relatively unchanged over the next decade. Basically, these goals are:

1. To provide an orderly, clean, comfortable environment for members of the community and its guests,
2. To allow the community to be made up of mixed backgrounds and interests so that they may retain their individualities,
3. To encourage dialogues between members of the community as a means of improving understanding, respect, empathy and tolerance for one another,
4. To promote participation in action programs which are beneficial to the community.

The goals of the city of Winter Park are established by the voters who elect a City Commission they feel is responsive to their wishes. The Commissioners implement the goals in the appointments they make to

Boards and Commissions, in the selections of the City Manager, Prosecutor and Judge and in the legislation they enact. (8,9) Thereafter, it is the responsibility of the governing bodies and of the electorate to act as overseers of the implementation process.

The Organizational Structure of the city of Winter Park, shown in Figure 2, illustrates the relationships between the various groups in regard to their appointments. (8) For example, the Commissioners appoint the prosecutor, judge, members to Boards and Commissions and the manager. The City Manager, in turn, chooses his staff and department heads within the guidelines provided by civil service laws. However, the figure is not complete since several Boards and Commissions are now shown, perhaps because the lesser ones have been omitted to simplify the figure. (5,10)

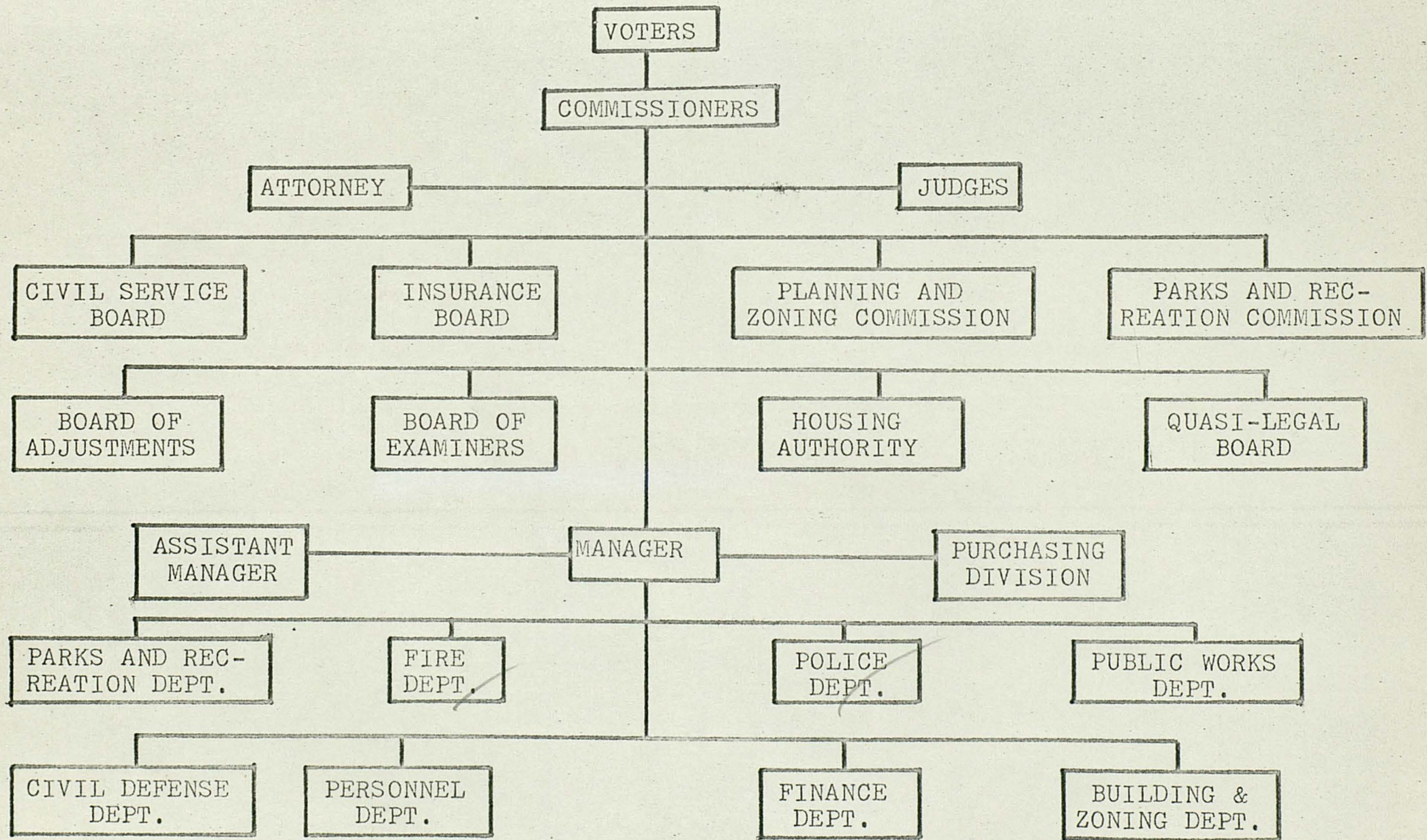


FIG. 2 - ORGANIZATIONAL STRUCTURE

CHAPTER IV

PROGRAMS, OBJECTIVES AND EFFECTIVENESS CRITERIA

The diverse responsibilities at various levels in the present organizational structure makes it relatively informal, flexible and allows petitioners a choice of paths when dealing with the government. On the other hand, the loose structure tends to confuse the public since it presents so many alternatives and possible overlaps in responsibilities. For example, there are several Boards of Adjustments and Appeals and Boards of Examiners of which some Boards act autonomously while others only have advisory roles. (8,10) It is worth noting that such functional differences are not distinguishable in Figure 2, that is, they appear to perform similar functions whether they are Boards, Commissions or Authorities.

To clarify the manner in which the goals of Winter Park may be achieved, six (6) programs have been identified, as shown in Figure 3, Winter Park Programs. The scope of each program is given below to enable the reader to distinguish their relationships and prerogatives.

1. Management Program - to set policies,
 - to determine priorities
 - to make budget allocations
2. Executive Program - to implement policies promptly and efficiently
3. Public Safety Program - to protect persons and their property from injury, misuse and destruction.

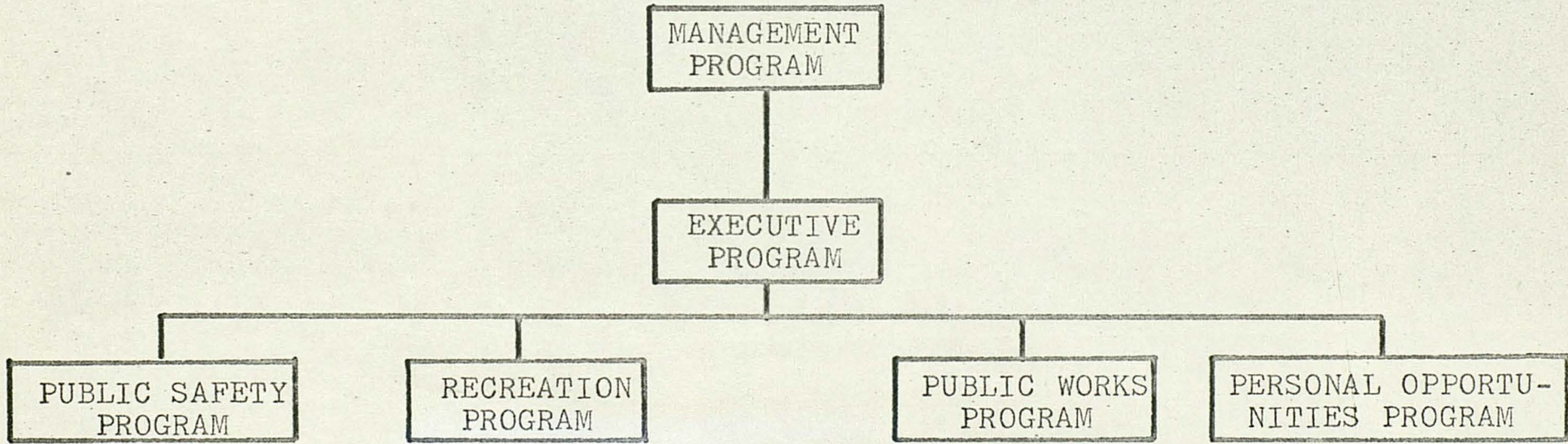


FIG. 3 - WINTER PARK PROGRAMS

4. Recreation Program - to provide the community with recreational facilities and activities.
5. Public Works Program - to provide the public with essential public services,
 - to maintain the repair public facilities.
6. Public Opportunities - to ensure community members receive equitable personal treatment

With the scopes of the programs defined rather broadly, it is now possible to tie specific objectives and effectiveness criteria to them. Taken as a whole, the objectives must satisfy the goals of the city of Winter Park, should not conflict with those of adjacent communities nor with county, state or federal regulations and should be reasonably free of overlapping. The effectiveness criteria, in turn, are quantitative indices that measure how well the objectives are being met, but rather than expressing static levels of achievement, they must be dynamic measures that indicate progress. The Programs, basic Objectives and Effectiveness Criteria are given below. (11, 12)

MANAGEMENT PROGRAM

Objectives

- to improve communication with the public to elicit ideas and support,
- to update and modernize legislation,
- to determine the nature and extent of current problems and take appropriate action,

- to improve budget allocations by strengthening and supporting promising action programs.

Effectiveness Criteria

- percent attendance at public meetings,
- percent voter registration and participation,
- per capita costs of programs,

ADMINISTRATION PROGRAM

Objectives

- to improve services provided to the community,
- to increase efficiency of operations and reduce costs,
- to improve and streamline administrative functions.

Effectiveness Criteria

- voter poll on community services.
- per capita costs of administrative programs,
- accessibility of administrative agencies

PUBLIC SAFETY PROGRAM

Objectives

- to reduce accidental and deliberate risks to members of the community and their property,
- to improve access and mobility of vehicular traffic,
- to strengthen the public's sense of security.

Effectiveness Criteria

- per capita rates of accidents, crimes and fires,

- per capita costs of accidents, crimes and fires,
- per capita costs of Public Safety Programs,
- percent loss of property per emergency,
- number of persons given lessons in accident, fire and crime prevention,
- number of persons given lessons in health and sanitation programs,
- number, nature and disposition of complaints against Public Safety Programs,
- community security index based on public surveys,
- frequency and quality of public safety related inspections,
- types of emergencies the Public Safety Program can and has handled.

RECREATION PROGRAM

Objectives

- to improve the acquisition, accessibility, quality and maintenance of recreational and cultural facilities,
- to improve the availability, diversity, quality and safety of recreational and cultural programs.

Effectiveness Criteria

- number and types of sports, cultural and social facilities and activities,
- per capita costs of recreational and cultural facilities and activities,

- frequency and quality of sports, cultural and social events,
- public opinion of adequacy and availability of sports, cultural and social facilities and activities,
- ratios of attendance versus capacity of various facilities,
- cleanliness, maintenance and safety of various facilities.

PUBLIC WORKS PROGRAM

Objectives

- to provide a reliable source of drinking water,
- to improve collection and treatment of solid and liquid wastes for purposes of improving the cleanliness and appearance of the environment,
- to maintain and improve public buildings, roads and equipment for safe, economical use,
- to maintain and improve building and zoning standards to enhance safety, quality of life and property values,

Effectiveness Criteria

- reliability, quality and cost of drinking water,
- frequency and quality of waste collection and treatment
- per capita waste production,
- per capita costs of waste collection and treatment,

- number of inspections, condemnations and demolitions of public and private buildings.
- per capita costs of building safety activities,
- types and costs of road maintenance and repair,
- number of road hazards removed,
- number and disposition of violations to sanitary standards,
- number and disposition of zoning requests and variances,
- public opinion of sanitary standards and of building and zoning regulations,

PUBLIC OPPORTUNITIES PROGRAM

Objectives

- to improve the standard of living and individual fulfillment by equitable social, economic and political opportunities,
- to eliminate social, economic and political barriers in the community,
- to improve availability, diversity, quality and accessibility of housing to all persons.

Effectiveness Criteria

- number of houses available by price range and location,
- number of families seeking housing by price range,
- per capita income of families seeking housing,

- number and nature of social, economic and political opportunities,
- opinion poll of Public Opportunities Program,
- number and disposition of complaints of inequitable treatment.

CHAPTER V

ANALYSIS OF THE ORGANIZATIONAL STRUCTURE

The purpose of the discussion that follows is to involve the non-scientist in PPBS by examining the Management Program using qualitative (non-analytical) techniques. In addition to the objectives from the previous chapter, broader ones from Chapter I will also be considered, i.e., making the program more visible, grouping similar functions together, reducing overlapping of responsibilities and constraining the agencies involved to work as a team. The author stops short of treating the effectiveness criteria such as percent attendance at public meetings, percent voter registration, per capita program costs and voter polls evaluating the effectiveness of the government because they are so easy to measure and interpret.

To fulfill the objectives of the Management Program, the public must understand what the government can and cannot do. Perhaps the best way to accomplish this is for the government to be organized along functional lines where the role played by each agency is clearly defined in simple terms and is consistent and logical. Any less, gives rise to frustration and discouragement when the public seeks to communicate with the government. These may stem from what appears to be buck-passing when the group he contacts passes him to another, merely because he is not able to determine whom to contact. On the other hand, the shunting may be due to fragmented and disperse responsibilities which provide an agency a pretext for passing the problem along to another group. It is

also possible for his problem to remain in limbo while agencies with overlapping responsibilities grapple with one another. These circuitous paths and the attendant delays cause the public to become critical, apathetic and cynical, attitudes which defeat the objectives of the Management Program by blocking communication and impeding passage of timely and effective legislation, together with apathetic acceptance of action programs and proposed changes in the budget.

The Organizational Structure of the city of Winter Park, shown in Figure 2, illustrates the relationships regarding appointments of the various governmental bodies but not their functional characteristics. The diversity of the present structure makes it informal, loosely organized, flexible and allows petitioners a choice of paths when dealing with the government. On the other hand, the diversity tends to be confusing and introduces the possibility of excessive overlaps in responsibility between the various Boards and Commissions. For example, Table 2, Authorities, Boards, Commissions and Committees in the city of Winter Park (8,9,10), indicates there are fourteen (14) Boards of which four (4) are Boards of Examiners, three (3) are Boards of Adjustments, two (2) are Boards of Trustees and five (5) are miscellaneous. In addition, there are three (3) Commissions, four (4) Committees and an Authority for Housing, for a total of twenty-two (22) groups that should be monitored by the Commissioners. Managing such a large group by the part-time Commissioners is indeed a heavy burden for which there are several solutions. One solution is to have each Commissioner responsible for four (4) or five (5) different groups so that all are covered. However, in the absence of a Commissioner, there would be a gap which could easily be remedied if eight (8) or nine (9) groups were assigned

each Commissioner. In the latter, coverage would be doubly redundant, that is, each group would be responsible to two Commissioners. Greater redundancy may be desirable but another solution may be advantageous, such as reducing the number of entities reporting to the Commissioners.

TABLE 2

AUTHORITIES, BOARDS, COMMISSIONS AND COMMITTEES

Authorities

1. Housing Authority of Winter Park

Boards

1. Civil Service Board
2. Parks and Recreation Board
3. Board of Adjustment
4. Housing Board of Adjustment
5. Building Code Board of Adjustments and Appeals
6. Electrical Board of Examiners
7. Mechanical Contractors Board of Examiners
8. Plumbers Board of Examiners
9. Lakes and Waterways Board
10. Insurance Board
11. Fireman's Pension Trust Fund Board of Trustees
12. Police Officer's Retirement System Board of Trustees
13. Solicitation Review Board
14. Contractors Board of Examiners

Commissions

1. Planning and Zoning Commission
2. Cultural Center Commission

3. Sidewalk Art Festival Commission

Committees

1. Downtown Planning Council
2. Vehicle-Equipment-Employee-Injury-Accident-
Investigation Committee
3. Bi-Racial Committee
4. Downtown Parking Study Committee

It seems reasonable to propose consolidation of several groups reporting to the Commissioners. For example, the functions performed by the Boards of Examiners for Electrical, Mechanical, Plumbing and General Contractors are probably very similar. A single Board could assume these functions in much the same way as members of the Board of Adjustment automatically serve on the Housing and Building Code Boards of Adjustments. Presumably, a single Board would handle four (4) times more work in this instance and might require a staff. Nevertheless, a more manageable situation would result together with economies in time, manpower and resources due to the consolidation.

To avoid excessive overlapping, it would probably be wise to combine the Parks and Recreation Board with the Lakes and Waterways Board. This would eliminate potential sources of confusion concerning the definitions and extents of park versus lake boundaries and any associated interfaces. Similarly, it seems logical for the Vehicle-Equipment-Employee-Injury-Accident-Investigation Committee to be part of an Insurance and Casualty Board. The Board could review all claims to see whether they are covered by existing policies, the extent of such coverage as well as its adequacy. At the same time, assessments of causes and responsibilities for the claim could be determined and

remedial action taken. In the same vein, arguments for combining the Civil Service Board, the Fireman's Pension Board and the Policeman's Retirement Board are that managing the associated accounts relative to deductions, insurance premiums, claims and promotions, would very likely be more economical.

The idea of functional grouping is neither new nor novel but is very likely the most useful structure for the city of Winter Park. It portrays the city's operation on a continuing basis rather than in a somewhat abstract fashion, that is, using the manner in which appointments are made as the basis for an organization chart. In Table 3, a proposed grouping of Authorities, Commissions and Boards is shown and, for purposes of comparison, the old, unconsolidated groups are also given. The result is that eight (8) entities report to the City Commission instead of the previous twenty-two(22).

It is clear from Table 3 that the proposed grouping merely consolidates similar functions without altering the scope or intent of the organization. Although the number of groups reporting to the Commissioners is reduced, it does not necessarily follow that voter participation is likewise reduced nor that an additional echelon is introduced. While there are fewer Boards, the number of participants in supporting functions could easily be larger so that the total involvement may well remain the same. These staff personnel would be on a par with other advisors hence a new echelon is not created. Clearly, involvement is reduced as regards contacts with the Commissioners, but that is considered a desirable feature. Other advantages are as follows:

1. Consolidated functional groups are more likely to establish and maintain a consistent set of precedents

TABLE 3

PROPOSED GROUPING OF AUTHORITIES, BOARDS AND COMMISSIONS

<u>PROPOSED</u>	<u>PRESENT</u>
1. Housing Authority	1. Housing Authority
2. Board of Adjustments and Appeals	2. Board of Adjustments
	3. Housing Board of Adjustments
	4. Building Code Board of Adjustments
3. Board of Examiners	5. Electrical Board of Examiners
	6. Mechanical Board of Examiners
	7. Plumbing Board of Examiners
	8. Contractors Board of Examiners
	9. Solicitation Review Board
4. Civil Service Board	10. Civil Service Board
	11. Fireman's Pension Trust Fund Board of Trustees
	12. Police Officer's Retirement System Board of Trustees
5. Board of Resources	13. Parks and Recreation Board
	14. Lakes and Waterways Board
6. Insurance and Casualty Board	15. Insurance Board
	16. Vehicle-Equipment-Employee-Injury-Accident-Investigation Committee
7. Planning and Zoning	17. Planning and Zoning Committee
	18. Downtown Planning Council
	19. Downtown Parking Study Committee
8. Cultural Activities Commission	20. Sidewalk Art Festival Commission
	21. Cultural Center Commission
	22. Bi-Racial Committee

- and rulings due their compactness and expertise,
2. Fewer groups are easier to manage and understand.
 3. Since all problems of a given class go through the same group they remain current on the status and disposition of such matters,
 4. The proposed groups must broaden their outlook in order to cover the same scope of responsibilities, therefore, it is likely they may have a better perspective of the public's needs,
 5. The broader responsibilities of each group suggest it has more power to create, disband or redirect staff efforts, very likely improving its responsiveness.

Concentrating power into fewer groups streamlines an organization and may have some attendant drawbacks. For example, the delegated responsibilities may be too great, or abuses may become more severe due to the concentration. However, these are considered to be minor because the city is small and no group is apt to have awesome tasks. Further, the city's electorate is not apathetic and will not hesitate to stop activities it deems harmful to its interests.

The result of reducing the administrative load on the City Commissioners is a streamlined organization which better distributes the work among six (6) echelons shown in the Functional Organization Chart, Figure 4. This contrasts with the Organizational Structure, Figure 2, which has eight (8) echelons. Note in Figure 4, Commissioners, Commissions and Staff to the Commissioners are in the same row since all

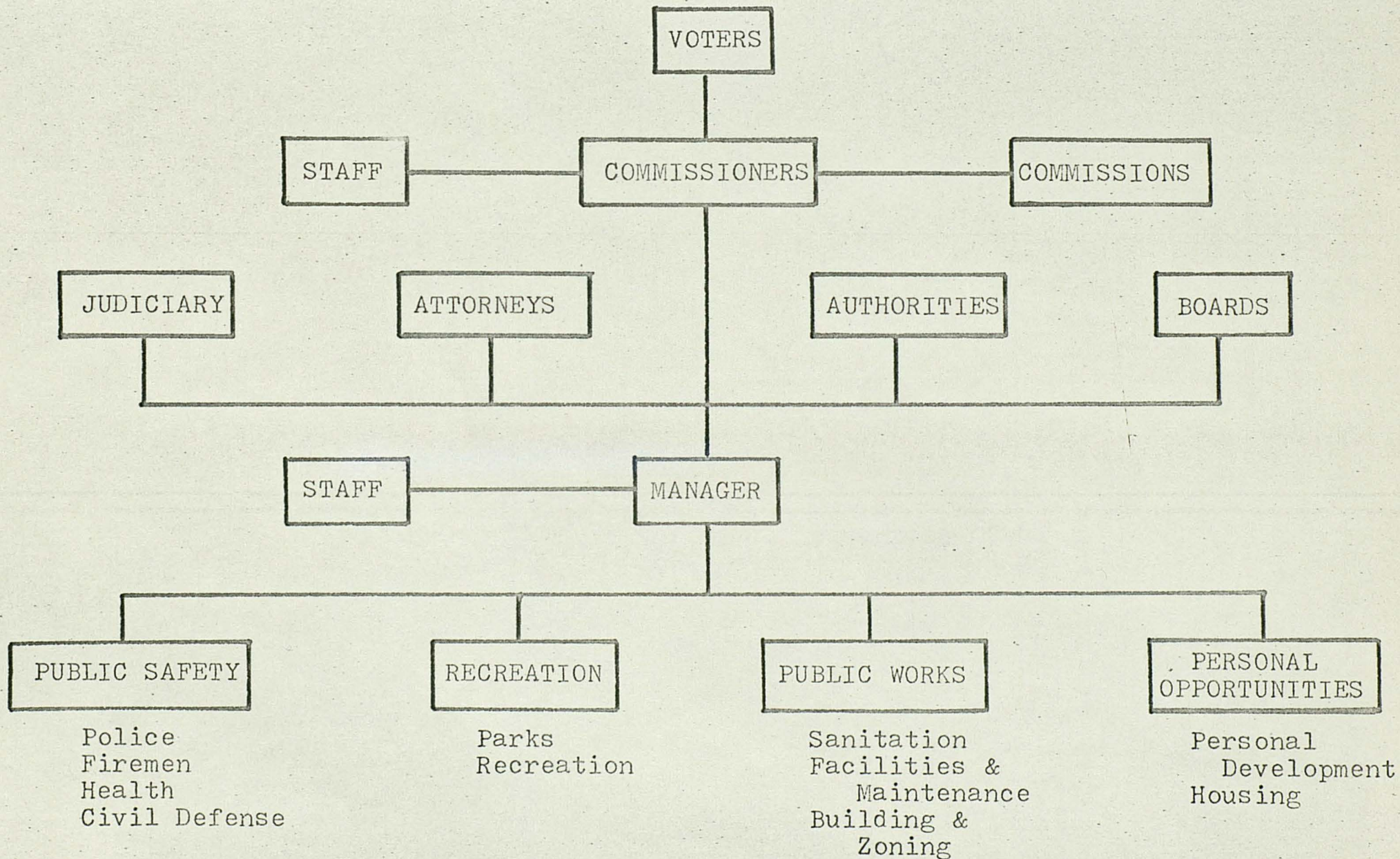


FIG. 4 - FUNCTIONAL ORGANIZATION CHART

actions involving these groups must go through the Commissioners. The Judiciary, Attorneys, Authorities and Boards occupy the next row and represent those groups that act autonomously within legislative boundaries. Together, the two rows under the voters represent the management team of the city.

The administrative function is performed by the City Manager who directs the four (4) programs, Public Safety, Recreation, Public Works and Personal Opportunities. Finally, the last echelon shows the various departments that implement the policies and directives from above. Thus, Figure 4, shows control of the city begins with the voters, passes through the Commissioners, the Manager and to the operating echelons that maintain contact with the public. Note that the Judiciary, Attorneys, Authorities and Boards are not in a direct line of authority since they act only in special circumstances and are constrained by the legislative prerogatives given them by the Commissioners.

CHAPTER VI

ANALYSIS OF THE FIRE DEPARTMENT

Responsibilities and Organization

The Fire Department in the City of Winter Park is divided into the Headquarters Unit located in the downtown area and the Lakemont Unit near the east end of the city adjacent to the Winter Park Memorial Hospital. The total strength of the department is 31 full time employees, a part time clerk, 12 volunteer firemen and 9 vehicles. It is organized into a Training Division, a Fire Inspection Division and a Combat Division and, as shown in Figure 5, the Combat Division is divided into three Combat Teams at each location in order to provide round the clock protection. The volunteer firemen are used to supplement the capabilities of either unit, as required. (13,14)

The Fire Department's responsibilities include responding to calls for help, training programs to maintain the firemen's mental and physical proficiency, public education to aid in fire control and prevention, inspecting to see that codes are met, granting of permits and maintaining good public relations. These activities are summarized monthly and annually and are categorized as follows:

1. Number and Type Calls Answered
 - a. Fire Emergencies
 - b. Non-Fire Emergencies
 - c. Non-Fire, Non-Emergencies
2. Fire Causes

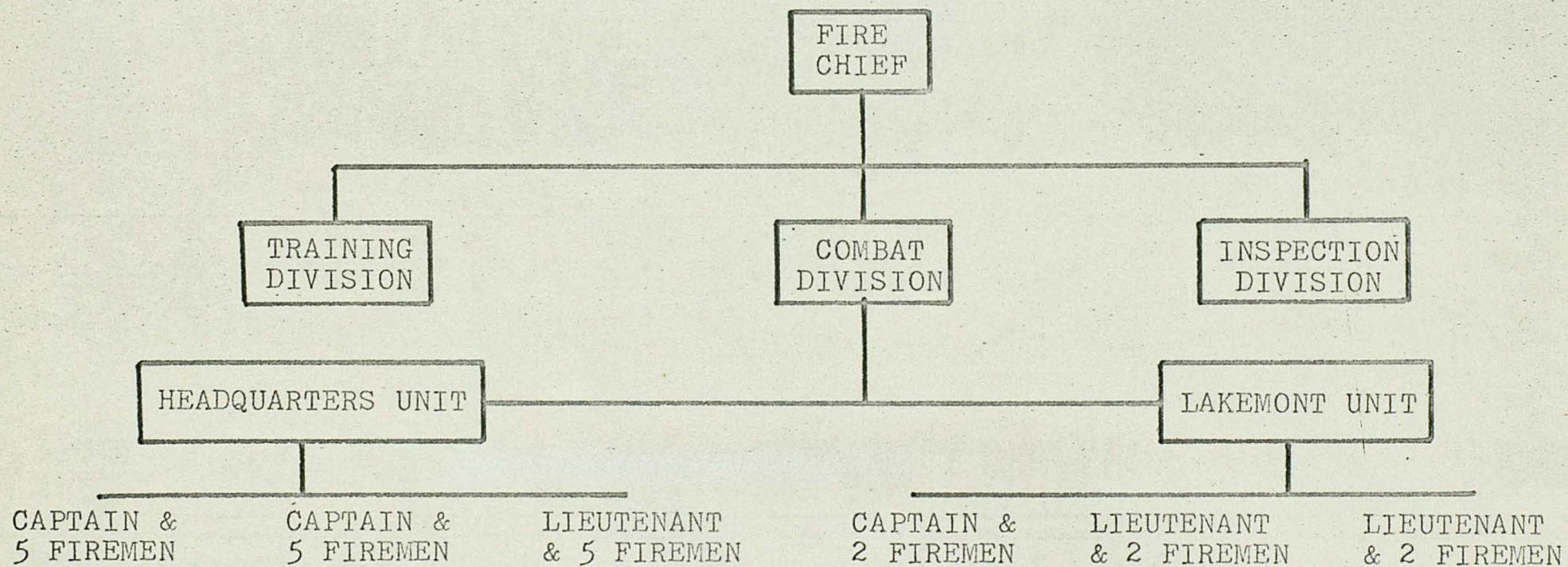


FIG. 5 - FIRE DEPARTMENT ORGANIZATION CHART

3. Value of Property Involved in Fires
4. Loss of Property Involved in Fires
5. Men Reporting and Time Spent on Emergency Calls
6. Major Equipment Used on All Calls
7. Major Overhaul and Preventive Maintenance
8. Fire Prevention
9. Water Supply
10. Personnel
11. Training

Task Analysis

The monthly data summaries of manhour expenditures were averaged for the years of 1971 and 1972 and are given in Table 4 below. (15)

A brief examination of similar data for several previous years suggests the averaged data is generally representative. The table lists the tasks, manhours per year and the percent time spent on each, where the 17,761 hours represents about 20% of the total available manhours. A significant part of the remaining time can be accounted for in vacation, sick leave, meals and rest time since firemen work 24 hour shifts (56 hour work week). Although the manpower utilization of about 5% in firefighting and of about 20% overall may seem low, it is typical not only in Winter Park and Orlando, but is applicable nationwide. By way of justifying this rather low utilization figure, Mr. Bland, Chairman of the National Commission on Fire Prevention and Control states, "However, when he (a fireman) is called upon he is in an extremely high stress situation. He is there, by definition, on an emergency, and he is called upon to do rather heroic things that normal human beings are

TABLE 4

TASKS VERSUS MANHOURS

TASKS	MANHOURS Per Year	PERCENT
Emergency Responses	3309	19
In Service Training	3916	22
Special Training	2900	16
Maintenance	2800	15
Chores	1814	10
Pre-Fire Surveys	1223	7
Non-Emergency Responses	683	4
Filing & Reporting	468	3
Research	368	2
Meetings & Conferences	165	1
Public Information	103	1
Investigations	22	-
	<hr/>	<hr/>
TOTALS	17,761	100.0

not expected to do. He's highly stressed physically, he's highly stressed emotionally, and it does have a long term physical and mental effect upon him." (17)

The "Emergency Responses"

Table 4 includes fires, non-fires and other situations. A more detailed breakdown of these is given in Table 5, below, together with the frequency and percent occurrence during 1971, the last year for which these details are available. However, after checking several previous years there was a variation of perhaps 5% in the percentages of fires, non-fire and non-emergency calls with the figures in the table being representative. Note that fire emergencies occur almost one-third of the time while non-fire emergencies occur twice as frequently and that less than 10% of the calls involve non-emergencies such as treed cats, malfunctions of privately owned sprinkler systems, burst water pipes and similar situation, responses which the department treats as good will gestures.

To illustrate the need for firemen to be ready at all times, an examination of calls over a four year period indicated that the number of calls per day varied from none to as many as ten, as shown in Table 6 below. To make the entries in the table clear, let us follow the statistics on a day when two calls are received. The second column shows there are 160.25 days per year, or 43.9% of the days (next column) when two calls are answered. If we sum the percentages from 0 to 2 calls per day, we find that 71.7% of the time less than three calls per day received. Another way of viewing these statistics is to see how many calls occur in groups of two, as shown in the next column, i.e. 320.5 calls occur in such groups. The last two columns show that 43.7% of the

TABLE 5
RESPONSE STATISTICS FOR 1971

	NUMBER	PERCENT
EMERGENCIES - FIRE		
Special*	105	13.6
Residences	85	11.0
Mutual Aid	10	1.3
Miscellaneous**	20	2.6
Sub-Total	<u>220</u>	<u>28.5</u>
EMERGENCIES - NON-FIRE		
First Aid & Rescue	303	39.3
False Alarms	85	11.0
Smoke Investigations	57	7.4
Flammable Spills	28	3.6
Power Lines	11	1.4
Sub-Total	<u>484</u>	<u>62.7</u>
NON-EMERGENCIES		
Public Relations	65	8.4
Sprinklers, Hydrants	3	.4
Sub-Total	<u>68</u>	<u>8.8</u>
TOTAL	772	100.0

* Special - includes automobile, brush, demolition and other fires

** Miscellaneous - Fires in business and public establishments

TABLE 6

FIRE DEPARTMENT RESPONSE DATA

N	D	%D	SUM %D	ND	%ND	SUM %ND
Calls per Day	Days	Percent Days	Sum Percent Days	Number of Calls	Percent Calls	Sum Percent Calls
0	50.5	13.8	13.8	0	0	0
1	51.0	14.0	27.8	51.0	7.0	7.0
2	160.25	43.9	71.7	320.5	43.7	50.7
3	72.25	19.8	91.5	217.5	29.6	80.3
4	18.0	4.9	96.4	72.0	9.8	90.1
5	8.5	2.3	98.7	42.5	5.8	95.9
6	3.0	.8	99.5	18.0	2.5	98.4
7	1.0	.3	99.8	7.0	1.0	99.4
8	.25	.1	99.9	2.0	.3	99.7
9	0	0	99.9	0	0	99.7
10	.25	.1	100.0	2.5	.3	100.0
Totals	365.0	100.0		733.0	100.0	

calls are received in groups of two and that 50.7% of the calls occur in groups of one or two.

The statistics in the Fire Department Response Data table clearly show that only 13.8% of the time no calls are expected on a given day. On the other extreme as many as ten calls have been received and the department must also be responsive to that condition as well. In the latter case outside help can be sought through mutual aid agreements with adjoining fire departments.

Budget, Tasks and Programs

The annual budget the Fire Department submits to the City Commissioners contains the following items: (18,19,20,21)

1. Personal Services

01 Salaries and Wages

01 Salaries Volunteer

02 Employee Benefits

2. Contracted Services and Commodities

03 Motor Transport Operating

04 Motor Transport Replacement

05 Radio Maintenance

07 Supplies and Chemicals

08 Hose

09 Telephone and Utilities

10 Hydrant Service

11 General Insurance

14 Station Maintenance

15 Contracted Services

16 Uniforms

17 Dues, Subscriptions, Training

18 Pension Trust Fund

3. Capital Outlays

20 Equipment

However, entries in the above listing can be deleted if the department does not need funds for a particular item or additional items may be included whenever they are needed.

With the present reporting and budgeting formats, it is very difficult to correlate fire control, fire prevention and other activities with their respective costs. The reason for the difficulty rests in the mixture of activities and of items in the budget. For example, the "Personnel" and "Training" activities pertain to fire control and to fire prevention which are distinctly different matters. Likewise, the budget entries, "03 Motor Transport Operating" and "16 Uniforms" are relevant to fire control, fire prevention and other topics.

Using Planning, Programming, Budgeting System concepts, it is possible to organize the Fire Department's activities into the three programs and twelve sub-programs, shown in Table 7.

TABLE 7

FIRE DEPARTMENT PROGRAMS AND SUB-PROGRAMS

PROGRAMS	SUB-PROGRAMS
1. Fire Control	Emergency Non-Fire Emergency Public Service Training and Research Public Education Pre-Fire Surveys
2. Fire Prevention	Training and Research Investigations Permits Public Education
3. Maintenance	Equipment Facilities

The programs can now be related to the tasks performed by the department, then the budget entries can be apportioned according to the manpower effort, as shown in Tables 8 and 9.

TABLE 8

FIRE DEPARTMENT PROGRAMS AND TASKS

PROGRAMS	TASKS	PERCENT
1. Fire Control	Emergency Responses	19
	In Service Training	22
	Pre-Fire Surveys	7
	Non-Emergency Responses	4
	Chores	<u>6</u>
	Sub-Total	58
2. Fire Prevention	Special Training	16
	Research	2
	Public Information	1
	Chores & Investigations	<u>4</u>
	Sub-Total	23
3. Maintenance	Maintenance	15
	Chores	<u>4</u>
	Sub-Total	19
	Total	100

TABLE 9

FIRE DEPARTMENT PROGRAMS AND BUDGET ALLOCATIONS

PROGRAMS	BUDGET ITEMS	PERCENT ALLOCATION
1. Fire Control	01 Salaries and Wages	58
	01 Salaries Volunteer	58
	02 Employee Benefits	58
	03 Motor Transport Operating	72
	04 Motor Transport Replace.	72
	07 Supplies and Chemical	100
	08 Hose	100
	09 Telephone and Utilities	58
	10 Hydrant Service	100
	11 General Insurance	58
	16 Uniforms	58
	17 Dues, Subscriptions, Training	58
	18 Pension Trust Fund	58
	20 Equipment	72
2. Fire Prevention	01 Salaries and Wages	23
	01 Salaries Volunteer	23
	02 Employee Benefits	23
	03 Motor Transport Operating	28
	04 Motor Transport Replace.	28
	09 Telephone and Utilities	23
	11 General Insurance	23
	16 Uniforms	23
	17 Dues, Subscriptions, Training	23
	18 Pension Trust Fund	23
20 Equipment	28	
3. Maintenance	01 Salaries and Wages	19
	01 Salaries Volunteer	19
	02 Employee Benefits	19
	09 Telephone and Utilities	19
	11 General Insurance	19
	14 Station Maintenance	100
	16 Uniforms	19
	17 Dues, Subscriptions, Training	19
	18 Pension Trust Fund	19

The dollar figures associated with each budget allocation is distributed among the programs according to the percent effort expended by the Fire Department personnel. For example, the "01 Salaries and Wages" entry is distributed as follows:

Fire Control	58%
Fire Prevention	23%
Maintenance	19%

For budget allocations that appear in two of the programs, the distribution is made according to the tasks. For budget allocation "04 Motor Replacement", it is distributed among the Fire Control and Fire Prevention Programs in the same ratios as their Percent Tasks.

Analysis

From the previous discussion and analysis, it is now possible to allocate funds to the sub-programs in the Fire Department, i.e., the Fire Control, Fire Prevention and the Maintenance Programs. The trends established by these can then be projected to estimate the levels of support which are expected to be needed in the near and more distant future. Finally, an evaluation can be made of the effectiveness with which the Fire Department achieves its objectives, namely, that of reducing accidental and deliberate risks to life and property and strengthening the public's sense of security.

For convenience, the effectiveness criteria pertaining to the Fire Department listed under the Public Safety Program in Chapter III are paraphrased as follows:

1. per capita rates of accidents and fires,
2. per capita costs of accidents and fires,

3. per capita costs of Fire Department Programs,
4. percent loss of property per emergency,
5. number of persons given lessons in fire presentation,
6. number and nature of complaints,
7. frequency and quality of fire safety inspections,
8. types of emergencies the Fire Department can and has handled.

In regard to effectiveness criterion, number 5, (170) junior high school students were instructed in 1971, while (400) received instruction in 1972. There is no estimate for how many will be instructed in 1973 because the Fire Department has no firm plans and since it depends on teacher invitations for such work. As far as number 6 is concerned, the only information available are a few testimonial type letters, most of which are complimentary, but of little other significance. Pertinent data could be obtained if people asking for aid would fill out a rating form but this effort is considered beyond the scope of this project. Finally, although the number of inspections performed in 1969 through 1972 are available, these data are of questionable value since the type and quality of these inspections are not specified. More importantly, the author does not have sufficient expertise to evaluate the quality impact or the effectiveness of the inspections, particularly when the number of inspections in 1972 are more than double those in each of the preceding three years.

Annual population data needed in projecting the multi-year financial programs of the Fire Department and in assessing its effectiveness are obtained using the method employed in Chapter 11. (7)

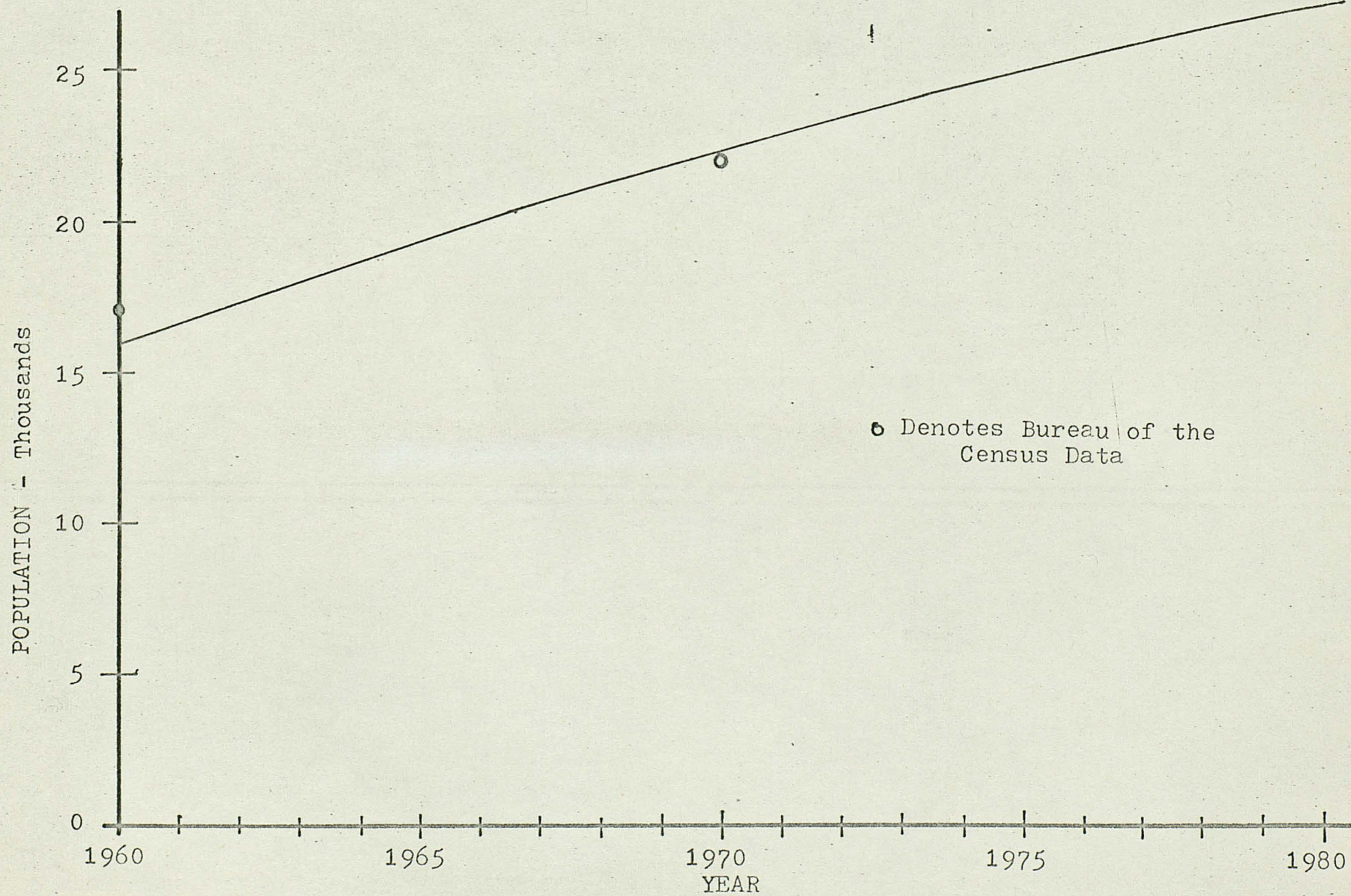


FIG. 6 - POPULATION 1960 - 1980

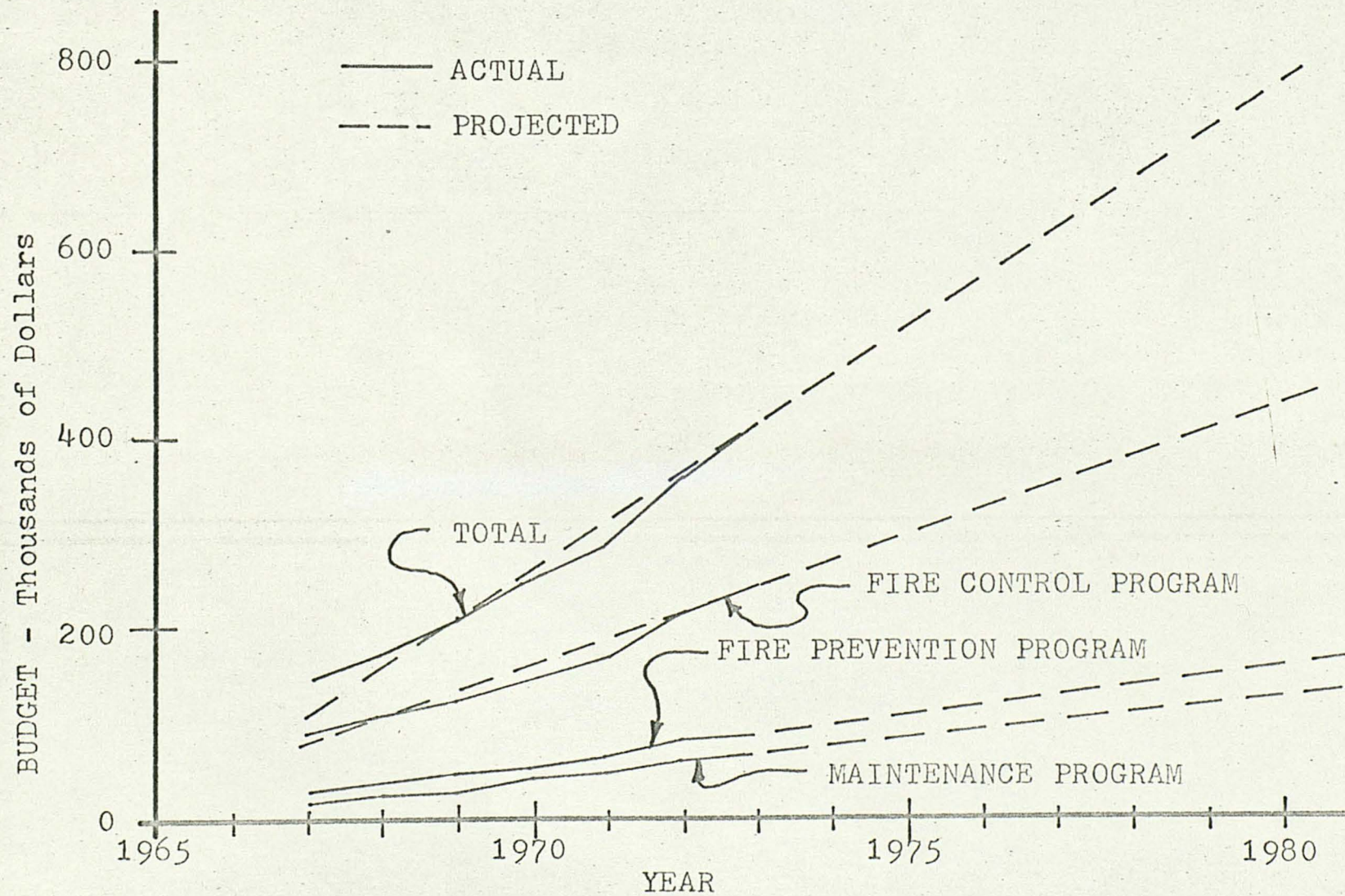


FIG. 7 - FIRE DEPARTMENT BUDGET

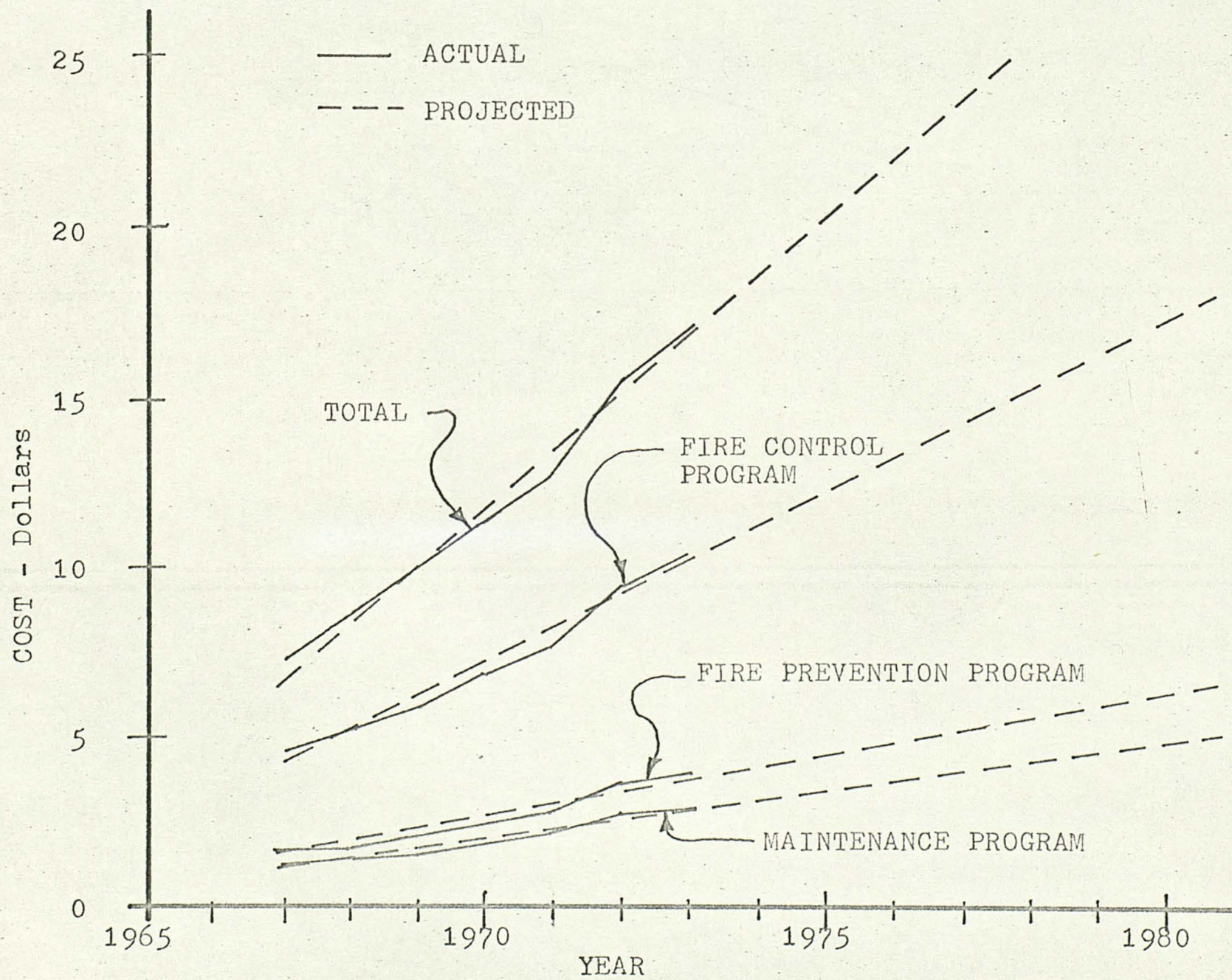


FIG. 8 - PER CAPITA COST OF THE FIRE DEPARTMENT

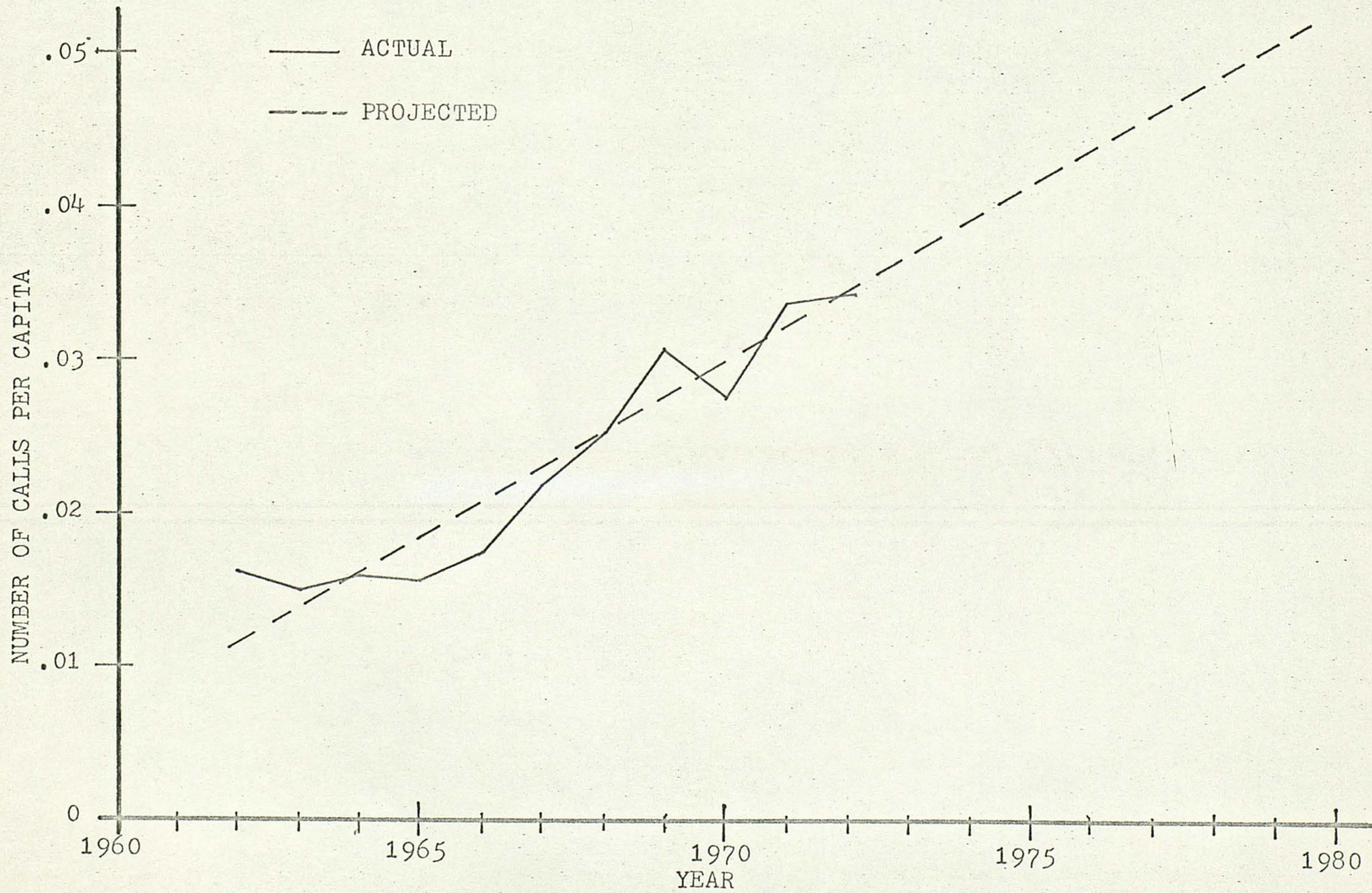


FIG. 9 - NUMBER OF CALLS PER CAPITA 1960 - 1980

The results shown in Figure 6 have an error of not more than 8%, accuracy which is felt to be entirely adequate for purposes of projections. Therefore, census data for 1960 and 1970 will not be used in the computations that follow.

The Fire Department budget, together with the amounts spent for the Fire Control, Fire Prevention and Maintenance Programs, are shown as solid lines in Figure 7 for 1967 through 1973. Dividing these annual budgets by the respective populations, the per capita expenditures shown in Figure 8 are obtained. The budgets and per capita expenditures curves seem to vary nearly in a linear fashion, so that a linear, least squares method was used to project these values through the year 1980.(22) Taking 1967 as the base year, the budget increases by about 7 times while the per capita cost is almost 4 times greater in 1980. As an independent check, the number of calls per capita are plotted for the years 1962 through 1972 in Figure 9. A least squares projection of these data through 1980 indicates an increase of almost two and a half times in calls per capita. This trend tends to support the rather sharp increases that are predicted to take place in the budget and per capita costs. Since the trends are relatively smooth, one may conclude the increases are normal, that is, they are increasing in cost along with prices in general. However, this argument does not apply to the trend noted in the number of calls per capita versus time.

To investigate the possibility that other factors may be at work, the ratio of the value of property exposed to fire to the losses suffered due to fire was checked as shown in Figure 10. From 1962 to 1967 and in 1969, these ratios were low ranging from 15 to 68, that is, for every 15 to 68 dollars of property exposed to fire, 1 dollar's

worth of damage occurred. In 1968 and 1970 through 1972, the ratios were high, ranging from 340 to 677, indicating relatively little damage was done to property exposed to fire. The range of values differing by a factor of ten and the apparent inconsistency suggest either the nature of fires have changed from high losses per fire or that the efficiency of the Fire Department has reduced the loss per fire.

In Figure 11, the ratios of property value exposed to fire to the Fire Department budget were plotted from 1967 to 1972. In 1967, 1970 and 1971 the ratios varied from 17 to 90, that is, for every dollar spent for the Fire Department, between 17 and 90 dollars of property were threatened by fire. However, for 1968, 1969, and 1972 the ratios 118 to 222, indicating that the value of property exposed to fire was much greater than the cost of the Fire Department.

The losses suffered in fires divided by Fire Department budgets are shown in Figure 12. This ratio has a value of 14.67 in 1969 while for the remaining years for which data are available, it is less than 0.6 indicating the loss during 1969 was extraordinarily high. The records substantiate this fact because severe losses were sustained in a fire in the Winter Park Mall (in March) when losses totaled more than three quarter of a million dollars. (14) The total losses for the year (\$2.867 million) are more than 20 times those of any other year. It seems quite clear the Fire Department was either not prepared to handle a fire of such magnitude or that insufficient warnings and precautions were taken.

Conclusions

Summarizing the information in Figures 10, 11 and 12, it seems that the Fire Department was relatively inefficient prior to 1967 and

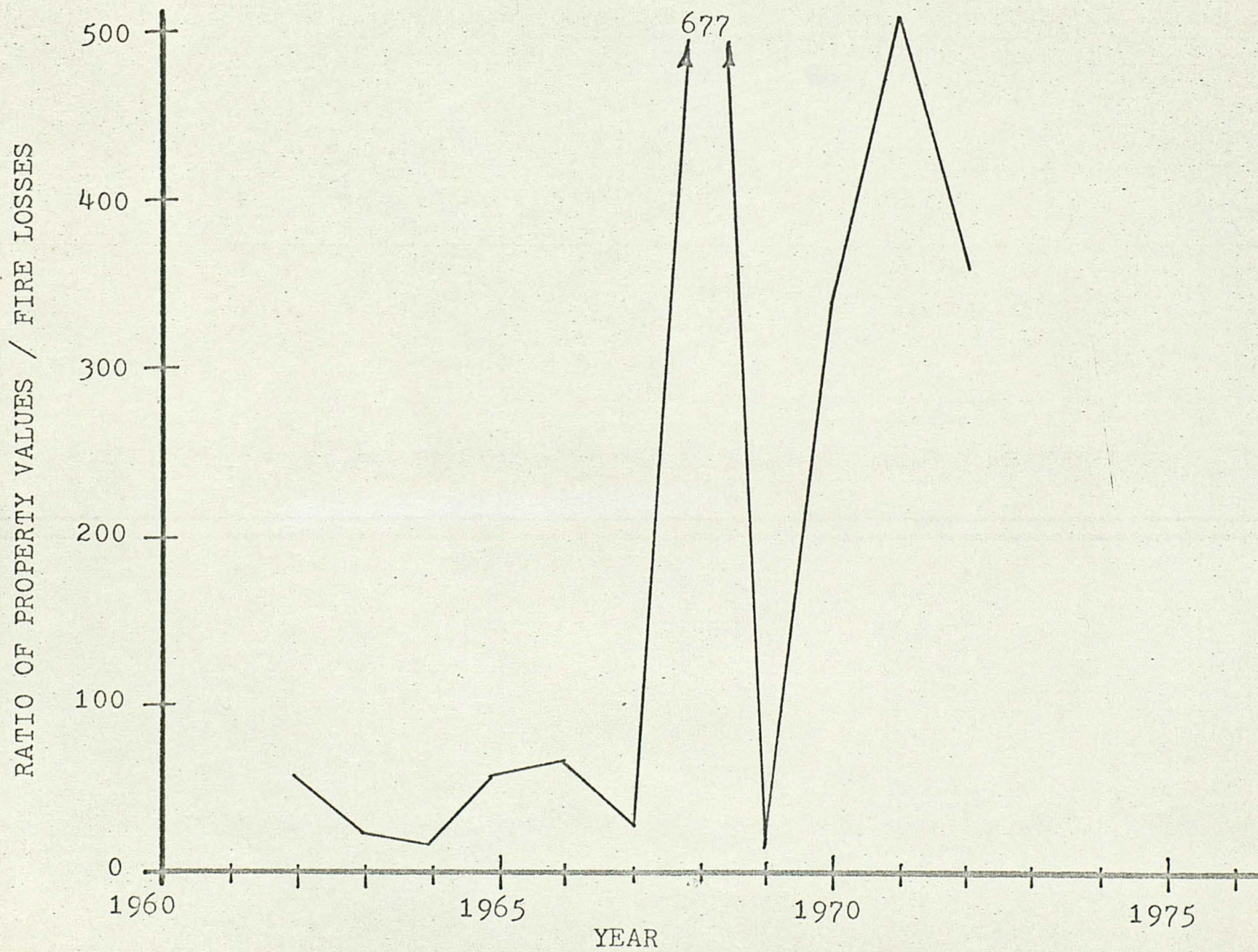


FIG. 10 - PROPERTY VALUES VS FIRE LOSSES

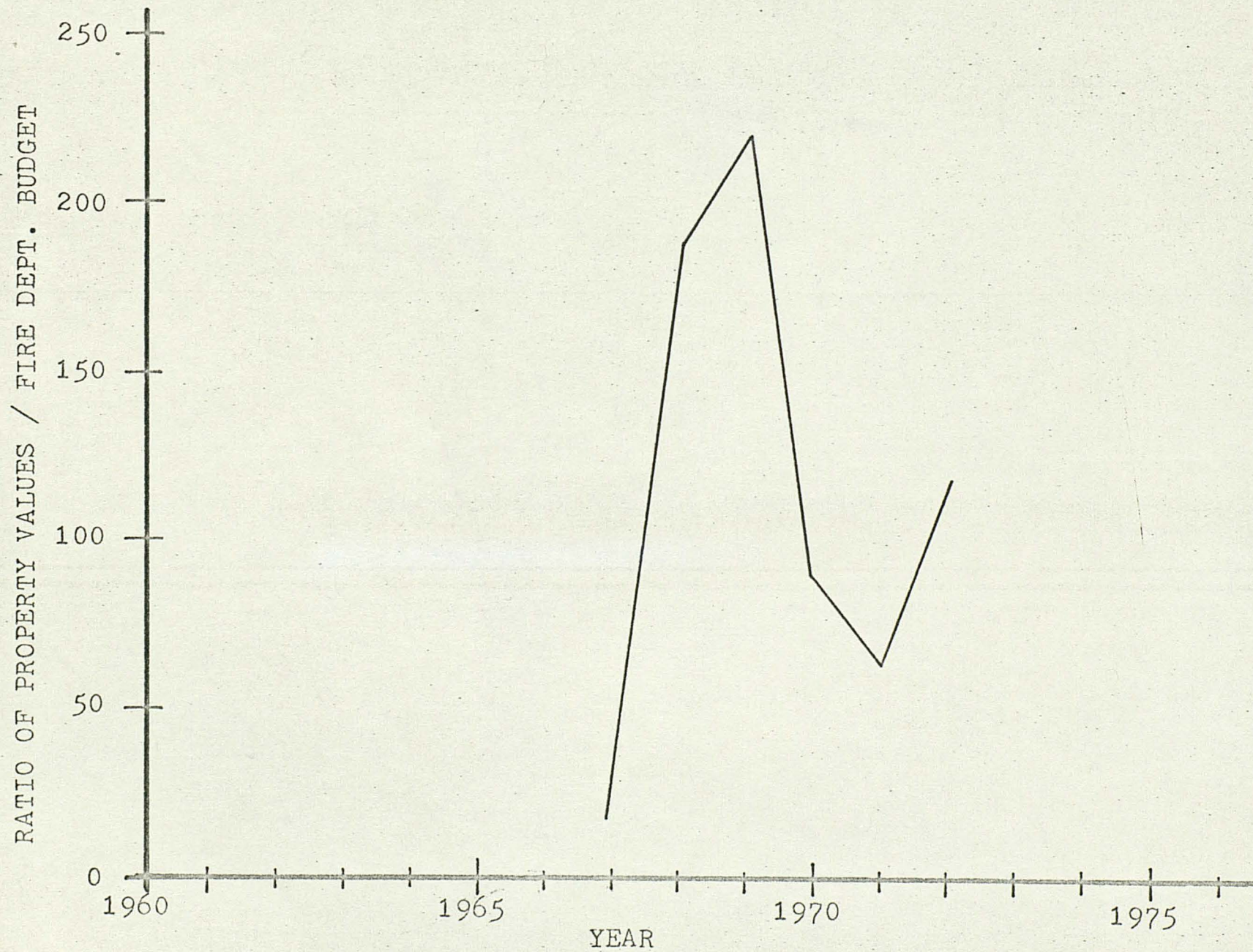


FIG. 11 - PROPERTY VALUE VS FIRE DEPARTMENT BUDGET

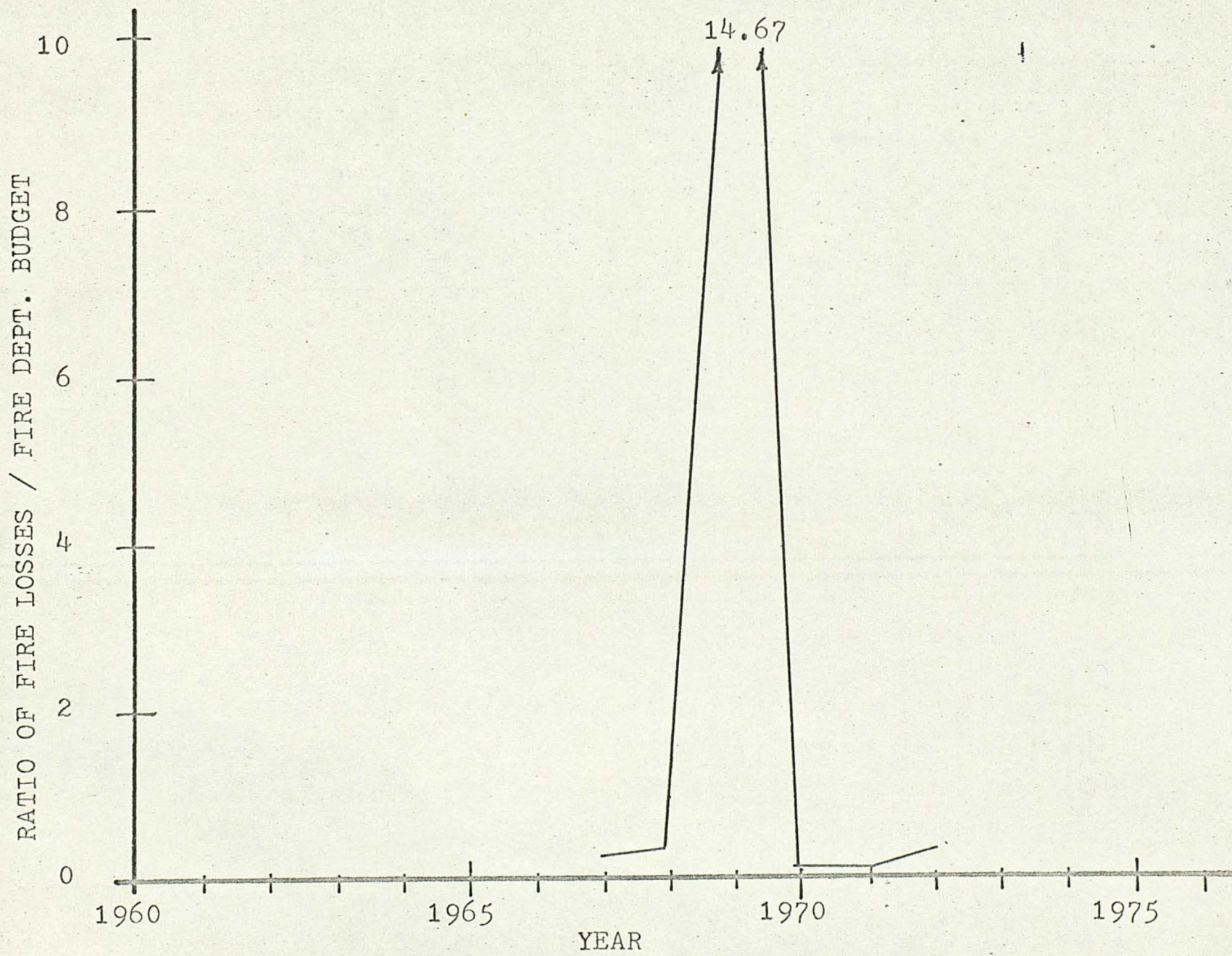


FIG. 12 - FIRE LOSSES VS FIRE DEPARTMENT BUDGET

in 1969 as evidenced by the low values in Figure 9. This is substantiated in Figure 11 since the value of property protected is relatively high compared to the costs of protection for the years from 1968 on. While Fire Department budgets are not available for prior years, it is estimated that these ratios were less than 50. Finally, in Figure 12, it appears that the Fire Department was able to keep losses down at a lower level from 1970 on than in previous years. Yet, there is a tendency for this ratio to rise but this is in response to increases in the value of property exposed to fire. Most importantly, the severe effect of the Mall fire suggests that the west end of Winter Park needs added protection since there are many new commercial developments there and more on the way. The headquarters unit would be seriously delayed if, in responding to a fire in that general area, a long, slow train blocked the way. It seems reasonable that as long as the number of calls per capita and property values continue increasing, that the budget of the Fire Department likewise should increase. Also, as property values increase, the availability of fire protection must be improved more or less proportionately. This means that fire fighting apparatus must have prompt access to the area and that adequate precautions, such as sprinklers, fire extinguishers, hydrants, fire doors and fire resistant materials, have been provided and the Fire Department must insure that all safety hazards are removed and proper fire safety practices are followed. Lastly, the City Commissioners must allocate enough money to each program to achieve the desired results. Perhaps if more money was spent for a strengthened prevention program, the Mall debacle could have been prevented.

CHAPTER VII

ANALYSIS OF PERSONNEL SYSTEMS

An essential part of PPBS is the application of quantitative analyses to solve important problems. One such problem confronting the Personnel Office in the Personal Opportunities Program, concerns the Fire and Police Departments who operate under Civil Service agreements and the remainder of the municipal employees who are not covered by any agreement. The latter group complains of inequitable treatment in regard to salaries, time off and fringe benefits. The complaints conflict with the objectives under the Public Opportunities Program, Chapter III, which seek to improve the standard of living and individual fulfillment by equitable economic opportunities and the elimination of economic barriers, and, the effectiveness criterion which concerns the number and disposition of complaints of inequitable treatment. The analysis evaluates the merits of the complaints and determines whether any advantages accrue to either the municipality or to the employees by changing to another arrangement.

The Problem

A Benefit-Cost Analysis is performed to determine which of three employment systems should be utilized by a municipal government. The kindness and indulgence of the administration of the city of Winter Park was of immeasurable help in identifying the problem and in providing data for this study. However, some of the data on the

Civil Service and Merit Systems described below, are postulated, therefore, the results must be viewed with care. Nevertheless, it is felt that the results of this analysis are not likely to change unless there are significant changes in the assumed values.

The first of the three alternatives is the Present System. It combines a highly structured civil service system for the Police and Fire Departments with a more loosely structured system for the remaining employees. Under this system, the average employee gets two (2) weeks vacation leave, six (6) days of sick leave and the city shares in medical insurance expenses at a cost of 12% of total wages. Annual wage increases are assumed to outpace the cost of living by 2% per year although the base rate of pay is perhaps 10% below that of adjacent communities. On the other hand, the environment is less stressful and it is felt this largely offsets the wage differential. Table 10 shows the data base for the Present System together with the present worth of the various entries for a period of ten (10) years and a 5% rate for the cost of money. Note in the table that the amount of sick leave actually taken by employees differs from the 2.3% to which they are entitled. In the case of administrative employees the actual leave rate is 1.2%, for civil service employees it is 2.4% and for the remainder it is 2.3%.

The Civil Service System assumes all employees are covered by a single, well structured system. Here, annual wage increases are 3% greater than the cost of living, a 5% wage boost goes to those employees who were not previously covered by civil service while the remaining benefits are unchanged. Because the system is more highly structured and secure, it is assumed that three more employees are

TABLE 10

PRESENT SYSTEM COSTS

	<u>Number of Employees</u>	<u>Annual Costs</u>	<u>Present Worth 10 yrs. 5%</u>	<u>Notes</u>
<u>A. Wages</u>				
1. Administration	11	\$ 114,700	\$ 1,000,000	2% annual
2. Civil Service Group	84	726,000	6,340,000	Wage
3. Others	174	1,154,000	10,080,000	Increase
<u>B. Vacation</u>				
1. Administration		\$ 4,580	\$ 40,000	
2. Civil Service Group		29,000	253,500	
3. Others		46,100	403,000	
<u>C. Sick Leave - Actual</u>				
1. Administration		\$ 1,400	\$ 12,200	1.2%
2. Civil Service Group		17,400	152,000	2.4%
3. Others		26,820	234,200	2.3%

TABLE 10 (continued)

	<u>Number of Employees</u>	<u>Annual Costs</u>	<u>Present Worth 10 yrs. 5%</u>	<u>Notes</u>
D. <u>Sick Leave - Allowable</u>				2.3%
1. Administration		\$ 2,650	\$ 23,100	
2. Civil Service Group		16,700	146,000	
3. Others		26,600	232,200	
E. <u>Fringe Benefits</u>				
1. Administration		\$ 13,750	\$ 120,000	
2. Civil Service Group		87,000	760,000	
3. Others		138,400	1,204,000	

$$\text{Management Costs} = A_1 + A_2 + A_3 = 17,420,000$$

$$\text{Benefits} = \text{Costs} - (1/2A_1 + B_2 + B_3 + C_2 + C_3 + E_2 + E_3) = 3,506,500$$

$$\text{Management Benefit/Cost Ratio} = \frac{3,506,500}{17,420,000}$$

$$\text{Employee Costs} = \text{Costs} - \text{Actual Benefits} = A_1 + A_2 + A_3 - \sum_{i=1}^3 (B_i + C_i + E_i) = 3,678,700$$

$$\text{Allowable Benefits} = \sum_{i=1}^3 (B_i + D_i + E_i) = 3,681,800$$

$$\text{Employee Benefit/Cost Ratio} = \frac{3,681,800}{13,738,200}$$

needed. Also, the amount of sick leave taken increases to 2.0% among administrative employees and is 2.4% for all others. The data in Table 11 summarize these facts and also gives the present worth of the entries over a ten (10) year period and 5% rate, plus an implementation cost of \$10,000. Some qualitative factors in this system are worth noting, for example, the emphasis on job security, tenure and seniority, particularly with respect to promotions.

The Merit System is a loosely structured system where semi-autonomous departments follow broad employment guidelines. Each department head bases the frequency and rate of wage increases and promotions on the performance of each individual. His decisions are no longer subject to the often time consuming review involving the administration and management, except for unusual circumstances. Under this system, vacations, sick leave, fringe benefits and retirement benefits are unchanged. Since the emphasis is on performance and permits some streamlining of operations, it is assumed that nine fewer employees are needed, or that a 3% improvement in service is possible with the present number. Table 12 summarizes these data and also shows the present worth of the various entries for a ten (10) year period and a 5% rate. The implementation cost of \$20,000 is also shown as a one time cost at the start of the system.

Analysis

To determine the quantitative benefits and costs of the three employment systems it is necessary to begin with the assumption that the services provided by the employees of the city of Winter Park are a direct function of their wages. Thus, the services they provide can

TABLE 11

CIVIL SERVICE SYSTEM COSTS

	<u>Number of Employees</u>	<u>First Year Costs</u>	<u>Present Worth Costs 10 yrs. 5%</u>	<u>Notes</u>
A. <u>Wages</u>				
1. Administration	12	\$ 131,300	\$ 1,200,000	3% annual
2. All Others	260	1,953,000	17,830,000	Wage Incr.
B. <u>Vacation</u>				40%
1. Administration		\$ 5,260	\$ 48,000	
2. All Others		78,200	714,000	
C. <u>Sick Leave - Actual</u>				
1. Administration		\$ 2,630	\$ 24,000	2.0%
2. All Others		46,900	428,000	2.4%
D. <u>Sick Leave - Allowable</u>				
1. Administration		\$ 3,020	\$ 27,600	2.3%
2. All Others		44,000	402,000	2.3%
E. <u>Fringe Benefits</u>				12.0%
1. Administration		\$ 15,770	\$ 144,000	

TABLE 11 (continued)

	<u>Number of Employees</u>	<u>First Year Costs</u>	<u>Present Worth Costs 10 yrs. 5%</u>	<u>Notes</u>
E. <u>Fringe Benefits</u>				
2. All Others		\$ 234,500	\$2,140,000	
Conversion Costs		\$10,000		

TABLE 12

MERIT SYSTEM COSTS

	<u>Number of Employees</u>	<u>Annual Costs</u>	<u>Present Worth 10 yrs 5%</u>	<u>Notes</u>
A. <u>Wages</u>				
1. Administration	10	\$ 125,000	\$ 1,195,700	4% annual
2. All Others	250	1,973,000	18,891,000	Wage increa.
B. <u>Vacation</u>				4.0%
1. Administration		\$ 5,000	\$ 47,800	
2. All Others		79,000	756,000	
C. <u>Sick Leave - Actual</u>				1.8%
1. Administration		\$ 2,250	\$ 21,550	
2. All Others		35,500	340,000	
D. <u>Sick Leave - Allowable</u>				2.3%
1. Administration		\$ 2,880	\$ 27,500	
2. All Others		45,400	434,500	
E. <u>Fringe Benefits</u>				12.0%
1. Administration		\$ 15,000	\$ 143,500	
2. All Others		236,500	2,260,000	
Conversion Costs			20,000	

be measured by total wages (TW) less unproductive costs paid them, such as sick leave, vacations, fringe benefits (LVF) and the costs of supporting them (assumed to be 1/2 the cost of the administrations wages), or 1/2A. The other half of administration is assumed to be for public service. The management of the city may now view the Benefit/Cost ratio as follows:

$$\text{Management Benefit} = \text{TW} - \text{LVFW} - 1/2A$$

$$\text{Management Cost} = \text{TW}$$

or,

$$1. \text{ Benefit/Cost Ratio} = \frac{\text{TW} - \text{LVFW} - 1/2A}{\text{TW}}$$

Note that capital costs are omitted from equation 1 because it is assumed that the equipment provided employees is the same in each of the three systems. Another way of stating it is that while mechanization can improve productivity, such changes were beyond the scope of this study.

The above Benefit/Cost Ratio evaluates the employment systems only from managements point of view. To add insight, the systems are evaluated from the employees viewpoint in a similar fashion. Here, the employee exchanges his services for wages but in addition, he also receives benefits, i.e., sick leave, vacations, fringe benefits, etc. His benefits in regard to sick leave are the allowable days he may elect to use rather than the actual, or, his total benefits are, LaVFW. Similarly, his costs are total wages less actual

benefits he has received, or, TW - LVFW. Restated, his benefits, costs and benefit/cost ratios are:

$$\text{Employee Benefit} = \text{LaVFW}$$

$$\text{Employee Cost} = \text{TW} - \text{LVFW}$$

or,

$$2. \quad \text{Benefit/Cost Ratio} = \frac{\text{LaVFW}}{\text{TW} - \text{LVFW}}$$

Results

The results of the analysis are tabulated below in Table 13.

TABLE 13

BENEFIT/COST RATIOS - PRESENT

	<u>Present System</u>	<u>Civil Service System</u>	<u>Merit System</u>
Management	79.9	79.6	80.3
Employee	22.7	26.0	28.5

It seems clear that the Merit System gets the highest ratings from both management and employee points of view. However, a question still remains of whether the gain in benefits will outweigh the additional costs. This is determined by finding how many dollars of benefits are purchased for the added costs. For example, if one dollar in costs brings 1.2 dollars of benefits, then the money is wisely spent, provided the budget can take it. If the benefits are less than the costs we get a ratio less than unity and we question the wisdom of the expenditure. Applying this test to the three systems, we get Table 14 below.

TABLE 14

CHANGE IN BENEFIT/COST RATIOS

Civil Service - Present System

Change in Benefits = \$15,148,000 - 13,913,000 = \$1,245,000

Change in Costs = \$19,030,000 - 17,420,000 = \$1,610,000

Change in Benefit/Cost = $\frac{1,245}{1,610} = .767$

Merit System - Present System

Change in Benefits = \$16,133,000 - 13,913,000 = \$2,220,000

Change in Costs = \$20,087,000 - 17,420,000 = \$2,667,000

Change in Benefit/Cost = $\frac{2,220}{2,667} = .832$

Conclusions

The analysis makes it clear that the benefits per dollar of cost is greatest in the Present System. It is felt that small changes in salaries, benefits and productivities will not significantly alter the conclusions in this report. However, non-quantifiable factors favoring a change in employment system would suggest that the Merit System would be the second choice and the Civil Service System would be ranked third.

TABLE 15

COMPUTATIONS

<u>PRESENT SYSTEM</u>	<u>CIVIL SERVICE SYSTEM</u>	<u>MERIT SYSTEM</u>
<u>Total Wages</u> = $\sum_{i=1}^3 A_i$		
= \$17,420,000	= \$19,030,000	= \$20,086,700
<u>Less Benefits</u> =		
($1/2A_1, B_2, B_3, C_2, C_3, E_2, E_3$) = \$3,506,700	= \$ 3,882,000	= \$ 3,953,800
<u>TW - Benefits</u> =		
\$13,913,300	= \$15,148,000	= \$16,132,900
<u>Management Benefit/Cost</u>		
= $\frac{13,913,300}{17,420,000} = .799$	= $\frac{15,148,000}{19,030,000} = .796$	= $\frac{16,132,900}{20,132,900} = .803$
<u>Actual Employee Benefits</u> =		
$\sum_{i=1}^3 (B_i + C_i + E_i)$		
= \$3,178,900	= \$ 3,498,000	= \$ 3,568,800
<u>Allowable Employee Benefits</u> =		
$\sum_{i=1}^3 (B_i + D_i + E_i)$		
= \$3,181,800	= \$ 3,475,000	= \$ 3,709,300
<u>T.W. - 3,178,000</u>		
= 14,241,000	= \$15,532,000	= \$16,518,000
<u>Employee Benefit/Cost Ratio</u> =		
$\frac{3,182,000}{14,241,000} = .227$	= $\frac{3,475,000}{15,532,000} = .260$	= $\frac{3,709,000}{16,518,000} = .285$

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