U.S. DEPARTMENT OF COMMERCE
National Technical Information Service

PB-252 029

CITY OF TACOMA SELECTIVE TRAFFIC ENFORCEMENT PROGRAM (STEP)

TACOMA POLICE DEPARTMENT

PREPARED FOR
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION

APRIL 1976

PB 252 029
DOT HS-801 872

CITY OF TACOMA SELECTIVE TRAFFIC ENFORCEMENT PROGRAM (STEP)

Contract No. DOT-HS-225-2-385
April 1976
Final Report

PREPARED FOR:
U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
WASHINGTON, D.C. 20590

Prepared for the Department of Transportation, National Highway Traffic Safety Administration, under Contract No. DOT-HS-225-2-385. The opinions, findings, and conclusions expressed in this publication are those of the authors and not necessarily those of the National Highway Traffic Safety Administration.

TECHNICAL REPORT STANDARD TITLE PAGE

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
DOT HS-801 872		

4. Title and Subtitle	5. Report Date
City of Tacoma Selective Traffic Enforcement Program (STEP)	April 1976
	6. Performing Organization Code

7. Author(s)	8. Performing Organization Report No.
Capt. R. H. McConnell N. A. David (Stanford Research Institute)	

9. Performing Organization Name and Address	10. Work Unit No.
Tacoma Police Department County-City Building Tacoma, Washington 98402	11. Contract or Grant No. DOT-HS-225-2-385

12. Sponsoring Agency Name and Address	13. Type of Report and Period Covered
U.S. Department of Transportation National Highway Traffic Safety Administration 400 Seventh Street, S.W. Washington, D.C. 20590	Final Report 16 June, 1972-31 December, 1975
	14. Sponsoring Agency Code

15. Supplementary Notes

Prepared with Stanford Research Institute, 333 Ravenswood Avenue, Menlo Park, California 94025

16. Abstract

The City of Tacoma Selective Traffic Enforcement Program (STEP) was one of several demonstration programs sponsored by the National Highway Traffic Safety Administration. The purpose of these programs was to examine various methods of selective enforcement and their relationship to accidents. The Tacoma STEP was unique in that new and somewhat controversial methods of enforcement were researched.

A philosophy of enforcement was developed during the program -- a goal of improved officer-violator relationship including the use of verbal contacts and a greatly expanded public information effort, designed to raise the public's awareness of potential accident-causing behavior. The benefits to a police administrator of this type of program fall generally into the category of improved public support for and understanding of both the enforcement operation and the individual traffic officer.

The program was conducted as a series of experiments. The degree of penalty severity, methods of violator contact, officer vehicle visibility, officer scheduling, driver attitude toward the program, and effects on future driving behavior were examined in detail. Accident effects of the various methods were studied at a very localized level and on a city-wide basis.

17. Key Words	18. Distribution Statement
Selective Traffic Enforcement, Accident Prevention, Police Methods, Traffic Safety Demonstration Programs	Document is available to the public through the National Technical Information Service, Springfield, Virginia 22161.

19. Security Classif. (of this report)	20. Security Classif. (of this page)
Unclassified	Unclassified

Form DOT F 1700.7 (8-69)

TABLE OF CONTENTS

TABLE OF CONTENTS (Concluded)

I INTRODUCTION

The Tacoma Selective Traffic Enforcement Program (STEP) was one of several demonstration programs sponsored by the National Highway Traffic Safety Administration (NHTSA). The purpose of these programs was to examine various methods of selective enforcement and their relationship to accidents. The Tacoma STEP was unique in that new and somewhat controversial methods of enforcement were researched.

The Tacoma STEP project extended over a period of three and one-half years (mid-1972-1975). Operations were conducted and supervised by the Tacoma Police Department and Stanford Research Institute provided assistance in project evaluation. This dual effort resulted in experimentation in methods of enforcement which was both acceptable from a police operational standpoint and amenable to analysis. This report is presented jointly.

II PROJECT SUMMARY

The objective of the Tacoma STEP was to examine the impact of various enforcement techniques on traffic accidents. Techniques used included experimentation in the degree of penalty severity, methods of violator contact, officer vehicle visibility, officer scheduling and public information compaigns. Halo effects and driver attitude toward the program were examined in detail. The answers to the questions below and attainment of four supplemental goals formed the basis for experimentation throughout the program. The Tacoma STEP philosophy, methodology, and conclusions are also discussed below.

A. Questions to be Answered by Tacoma STEP Research

- Does general traffic enforcement effort measurably affect overall accident rates?
- Do selective enforcement techniques reduce accidents at specific locations?
- Were there differences in the accident reduction effects of placing highly visible as opposed to less conspicuous police officers at high-accident locations?
- Were there differences in the accident reduction effects of concentrating task force units at specific high-accident locations as opposed to scattering them throughout the general area?
- Can a particular enforcement countermeasure be shown to have a halo effect on drivers over time and area?
- Could verbal contacts be substituted for citations without resulting in greater incidents of accidents and violations?
- Do public information campaigns as conducted in Tacoma result in greater driver awareness of and cooperation with traffic enforcement goals?
- Could public attitude toward traffic enforcement be measurably altered using the Tacoma STEP philosophy (see page 4 for description of philosophy) of enforcement?

---

*Halo Effects: Phenomena of increased driver altertness for a period of time or for a certain distance following observation of a police officer.

- Can traffic officer image be improved using Tacoma STEP philosophy?

B. Supplemental Goals

- Provide a manual of traffic enforcement operations based on Tacoma research experiments supported by scientifically tested and documented evidence applicable to Tacoma and other jurisdictions.

- Develop a method of officer evaluation based on criteria other than citation counts.

- Develop scheduling techniques which would challenge and interest police officers as well as provide for maximum high-accident location coverage.

- Establish the criteria necessary for placing a location on and removing it from a priority list for selective enforcement effort.

It was not intended that this selective traffic enforcement program prove that all past enforcement efforts had been for naught; nor was it anticipated that any methods of enforcement could be shown to solve all traffic problems. STEP, in the city of Tacoma, was designed to scientifically test both traditional and new enforcement techniques in a controlled atmosphere and to provide documentation of the results. It was intended that for each of the enforcement techniques tested, one of the following conclusions would be reached:

- The technique was MORE effective in preventing accidents than one or more other techniques.

- The technique was LESS effective in preventing accidents than one or more other techniques.

- There was no difference in accident prevention effectiveness between two or more techniques.

C. Project Philosophy

The prevalent traditional theory of traffic enforcement has been that an increase in enforcement effort, i.e., more citations, directly relates to a corresponding reduction in collisions. However, when Tacoma citation volume was actually compared to accident incidence prior to STEP it became apparent that there was neither a negative nor postive relationship between the two.

Furthermore, a concern for revenue and/or the evaluation of traffic officers by citation production has often appeared to obscure the primary enforcement objective--accident prevention.

An attempt was made to better the traffic enforcement situation via the introduction of the theory of Selective Enforcement. This theory stated that if accident rates were to be cut back, then enforcement personnel had to be assigned to high-accident locations at the times accidents typically occurred, with the primary task being to apprehend those drivers who were committing accident-causing violations. Unfortunately, the application of this theory did not result in accident reductions. It appeared that the reason for its failure might be that the concern for citation counts, i.e., the number of citations to an officer's credit as a determining factor in officer evaluation by supervisors, led officers to position their cars so as to be inconspicuous to drivers approaching the high-accident location. Thus the driver was not stopped until after the accident-causing violation had been committed.

Tacoma STEP philosophy therefore placed emphasis on preventing accidents through selective placement of officers in high-accident locations in clear sight of potential violators. Officers were relieved of the pressure to dispense citations by changing evaluation methods. In addition to the number of verbal contacts, written citations, warnings and arrests that were made, officers were evaluated on their reliability in meeting assignment schedules, the quality of their contacts, and the opinions of the violators who were contacted.

Further, Tacoma STEP philosophy was based on the assumption that most violators were not habitual offender types and therefore could be influenced by an attitude of concern and reason on the part of enforcement officers. This assumption was based on the fact that a check through past histories of drivers who had been involved in accidents showed that the high-citation driver was not in the majority. During the first six months of the actual program operations, accident drivers judged at fault were sampled and their records were searched. It was found that 71 percent had one or no previous citations on record and that only 12 percent had five or more.

Throughout the Tacoma STEP program this philosophy was implemented by an intensive public information campaign via the media, and by making as many contacts with violators as possible with emphasis placed on an attitude of concern being shown by contacting officers. This approach was designed to raise the public's awareness of potential accident-causing behavior and favorably influence their image of the enforcement officer and enforcement practices and goals in general.

Finally, Tacoma STEP philosophy entailed the view that a citation may not necessarily be the only method of traffic enforcement contact. Whereas citations are extremely valid under certain circumstances, there are many incidents which might properly be handled by verbal contact dependent upon considerations of all the factors--violation type, traffic volume, and potential hazard. It was felt that greater use of verbal contact in lieu of citations in appropriate circumstances would further improve public attitudes toward enforcement and lead to greater voluntary acquiescence to the law.

D. Task Force Organization

Taking advantage of experience gained in other projects, where non-research oriented people were involved in conducting experiments and gathering data of an extremely detailed nature, it was decided in the planning stages of Tacoma STEP that all personnel involved in the project were to have a voice in the creation, alteration, and evaluation of each countermeasure applied. Technical assistance of an evaluator was obtained from an outside agency, Stanford Research Institute. Periodic conferences were therefore instituted between STEP personnel and the evaluator. These conferences were held during each visit to Tacoma by the evaluator. Between these visits, officer comments regarding problems or improvements were solicited by first-line supervisors and project staff and, if necessary, relayed immediately to the evaluator for action. Whenever feasible, officer input was acted upon by the project staff and evaluator.

Implementation of study directives began with the establishment of a STEP task force in addition to the usual Tacoma enforcement personnel. Task force officers were associated with STEP on a full-time basis and their only duties, except in emergency situations, were those related to STEP countermeasures. The task force of 10 specially trained, experienced police patrol officers, was divided into two teams of equal size, each supervised by a police sergeant. The sergeants reported directly to the STEP Project Director, a police lieutenant. Experimental design elements were defined to facilitate statistical analysis and then set into operation in an actual working enforcement environment.

E. Program Operations

For the Tacoma STEP experimentation, the city was divided into three areas which experienced similar numbers of accidents annually and contained roughly an equal number of high-accident intersections. Throughout the study, various combinations of experimental/control group assignments were made in these areas. Task force activities in an area concentrated on extensive violator contact at high-accident intersections.

Typically, all STEP officers were assigned to one area at a time; the length of time in an area varied among the experiments conducted. The method of preventive enforcement used for the Tacoma study involved a combination of stationary observation at assigned high-accident locations and patrol in a general assigned area. The details of assignment varied from experiment to experiment, but for each experiment officers received a daily schedule showing the countermeasures to be exercised, the area of operation, and the exact times and locations for stationary observation. According to this plan, the anticipated accident reduction effects would be concentrated at assigned high-accident locations and would be generally evident in the experimental area.

STEP officers were instructed to contact all violators observed, particularly those committing hazardous violations. STEP personnel received special training in officer-violator relations which stressed the positive aspects of enforcement contacts regardless of whether or not a citation was issued. Complete documentation of all contacts, whether or not a

citation was issued, was required of STEP officers only. Contacts, not citations, were used by the supervisors to determine the "production" portion of an officer's evaluation.

The Tacoma STEP philosophy dictated that a study of penalty severity be made. Violators stopped for certain nonflagrant, or less hazardous violations were, at times, given what is termed a verbal warning which involved no fine or other police action; flagrant or more serious violations always received the normal penalties and actions. Lists of violations were prepared for STEP officers so that the determination of penalty severity (citations or verbal warnings) for each contact would be made in accordance with project experimentation. Other officers were instructed to continue with normal citation policies.

F. Project Evaluation

Two selected examples were drawn from violators contacted under each method (citation and verbal warning) and for the same violations. Drivers were tracked for a period of one year to ascertain the effects on future driving behavior of the two methods. In addition, questionnaires were sent out to violators contacted by both STEP and regular officers in order to determine whether a difference in attitude toward enforcement could be detected.

In accordance with the experimental design, statistical tests for STEP effects were used on the accident data. A series of tests were made for various experimental/control, before/after situations. In all cases, a 2-way analysis of variance was used to compare the number of accidents which occurred during STEP-related activities. The F-tests used for the analysis of variance considered differences between experimental and control areas.

Since very precise data were available on accident location and STEP officer locations, coordinated to the hour, a halo effects evaluation was made. Computer plotting routines were used to examine the number of accidents occurring as a function of time and distance following a STEP officer visit. Time series methods were used to examine enforcement effects over time.

G. Conclusions

In general, it was concluded that regardless of the techniques involved, traffic enforcement could not be shown to effect a measurable sustaining positive or negative impact effect on overall accident experience in the city of Tacoma. Whereas some aspects of preventive enforcement tended to show short-range, isolated reductions in traffic collisions, the temporary gains were offset by a return to pretest collision levels despite a continuance of the techniques under test.

Specifically, Tacoma STEP research conclusions were as follows:

- No accident reduction effects attributable to STEP were shown: Tests for possible effects were made in various time frames and at various levels of localization.
- A highly visible mode of operation was preferred by officers.
- No differences in recidivism were shown between individuals contacted with a citation and those contacted verbally.
- Use of on-street personnel in the public information effort proved to be a positive experience for both the officers and the public.
- Traffic violator attitudes toward STEP officers were more favorable than toward other officers. Verbal contacts were received more favorably than contacts involving citations.
- Documentation of verbal contacts was considered by officers to be essential.
- Maintenance of officer morale would appear to require that no more than 3 hours per day be scheduled and that unscheduled periods of time be provided between scheduled hours.

In addition, it was found that the preventive enforcement approach had a positive effect on the officer's attitude toward violators and their entire outlook toward their job. They found it easier to deal with violators on an adult-to-adult level. Violator attitudes were shown to be more positive using preventive enforcement techniques, whether or not the enforcement contact involved issuing a traffic citation or verbally warning the violator.

Therefore, considering these positive effects and the fact that Tacoma STEP philosophy can be implemented without additional operational costs and with no accident increase effects shown, it can be considered a viable alternative to traditional enforcement methods.

III STEP IN THE CITY OF TACOMA

A. Demographic and Physical Characteristics of the City

The city of Tacoma accounts for 154,581 of the total metropolitan population of 411,000.* The metropolitan population (drawn from city and suburban residential areas, as well as Army and Air Force installations) is approximately 93 percent Caucasian, 7 percent Black, and 52 percent female, 48 percent male. The city population has increased by less than 5 percent since 1960 and 3 percent since 1970. About 70 percent of the residents own their own homes and the population is little affected by tourism, seasonal influx or the existence of retirement communities. Apart from the 52,000 members of the Armed Forces and their dependents, the Tacoma metropolitan area represents a stable population with a slight shift to the Tacoma suburbs in recent years.

The average net effective buying income of a Tacoma household is about $11,000 (1972) with the majority of income made and spent in the city. The economic base for the city is industrial with a wide variety of manufacturing establishments employing 19,200 people.

Tacoma has two universities and two colleges together enrolling about 15,000 students and public schools enrolling approximately 37,000 students. Tacoma has 14 private primary and secondary schools in addition to 57 public schools.

There are approximately 87,130 licensed drivers residing in the city of Tacoma, 54 percent male, 46 percent female. About 50 percent of the drivers are under age 35.

Approximately 101,209 vehicles of all types are registered in the city, 66 percent of which are passenger vehicles.

1. Traffic Accidents

Traffic accident data have been processed in Tacoma since 1963 and accidents have been a continuing problem resulting in about 1,500 injuries with about 20 fatalities each year since 1963. Thus, close to one percent of the Tacoma population has met injury or death on the roadway each year.

---

*Population and related figures based on 1970 census.

In 1972, prior to the initiation of STEP, there were 3,906 reported accidents (reporting requirements are $100 damage and/or injury regardless of severity) or about 8.6 accidents per mile of paved road. Of these 1972 accidents, 1,044 involved casualties and 21 involved fatalities. The highest accident rate times prior to STEP were Monday through Saturday, 1000 to 1900 hours, and Friday and Saturday nights, 1900 to 0200 hours. During 1972, 43,787 arrests, citations and written warnings were recorded in Tacoma for traffic violations.

2. Street System

There are a total of 658.9 miles of streets within the city of Tacoma of which 453.6 miles are paved. Included in this total figure are 220.9 miles of arterial streets, 26.06 miles of state highways and 8.04 miles of limited access freeway (see Figure 1). It should be noted that of the 220.9 arterial street miles, 215 miles are lighted to minimum 1-ES standards. There are currently a total of 4,814 intersections within the city, and of these 390 are arterial-arterial. There are 240 signalized intersections of which 137 include walk-wait lights for pedestrians. A total of 2,649 stop signs and 268 yield signs are utilized in the city.

3. Police Force

The Tacoma Police Department is divided into two major bureaus, Operations and Investigation, each commanded by an assistant chief. Service functions such as records and communications are the responsibility of noncommissioned personnel working under civilian directors.

The Traffic and Patrol Divisions are organized under the Operations Bureau. The Traffic Division (23 total personnel) has primary responsibility for the enforcement of traffic ordinances. Accidents are investigated by the Patrol Division (124 total personnel) with backup provided by the Traffic Division. Patrol has normally accounted for less than 20 percent of the traffic enforcement effort. The STEP task force was organized as a separate division under the Operations Bureau.

During the project the Tacoma Police Department consisted of 246 commissioned personnel of the following ranks:

Chief of Police	1
Assistant Chiefs	2
Captains	6
Lieutenants	14
Sergeants	43
Investigators	53
Police Officers	127
Total	246

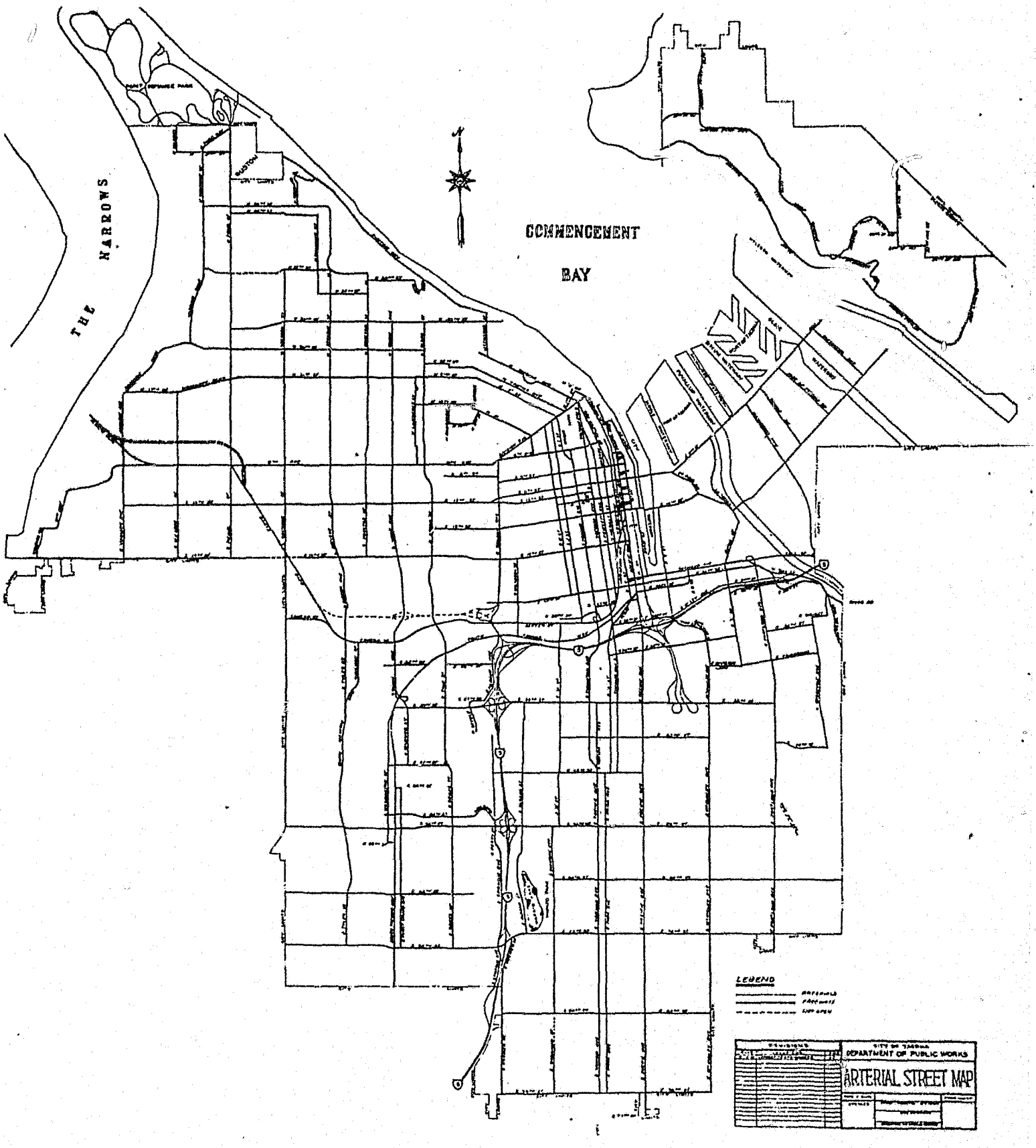


FIGURE 1 ARTERIAL STREETS IN TACOMA

B. STEP Project

1. Task Force

The STEP task force was established as a separate entity and task force officers' only duties were those related to STEP countermeasures, except in emergency situations. All task force officers were associated with STEP on a full-time basis. The task force was composed of 10 police patrol officers specially trained in traffic enforcement, officer-violator relations, and general public relations techniques. The 10 officers were divided into two teams of equal size, each supervised by a police sergeant. The sergeants reported directly to the STEP Project Director, a police lieutenant. All patrol officers and supervisors were selected from numerous volunteers within the existing Tacoma Traffic and Patrol Divisions and all were experienced police officers. Additional project staff included a full-time secretary/data aide and a public information officer (noncommissioned). The personnel assigned to the STEP project were over and above the regular personnel complement of the police department and thus the project in no way reduced the effort normally expended on police services.

All STEP field personnel worked a regular 1030 hours to 1830 hours shift, Monday through Friday. No STEP personnel were assigned to weekend or nighttime duties for the program. It was determined that these weekday shifts would provide maximum coverage during the predominate accident times at the high-accident locations under study.

The duties of the public information officer were to create and coordinate all public information about STEP. The public information campaign included radio, television appearances; radio,television and news releases; and the use of STEP personnel as guest speakers at many group and organizational meetings. The general theme of the public information campaign was that STEP was a research project designed to test various methods of making traffic contacts and utilizing manpower for the purpose of seeking ways to reduce traffic accidents.

2. STEP Interface

The two judges who sat in the municipal court were responsive and supportive of the STEP program and cases were normally resolved within 60 days.

As a matter of course, the Tacoma traffic engineering staff regularly examined traffic control devices, speed limits, parking restrictions, and traffic volumes. The staff made available start and completion dates for all construction work in the city and were involved in the initial effort of selecting high-accident locations for STEP study.

The Traffic and Patrol Divisions were notified on a weekly basis of STEP task force activities so that dual coverage could be avoided. Meetings were held with the Chief of Police and with Traffic and Patrol Division heads to discuss those features of STEP which might aid Tacoma police in the future. Officer morale and the operational efficiency of countermeasures were closely watched to determine the feasibility of continuing STEP methods after project completion.

3. Project Costs

Administrative and operational cost figures listed below represent expenditures for the planning stage which began 16 June 1972, the operations stage which began on 5 February 1973 and ended on 30 June 1975, and the final report writing period of 1 July 1975 through 31 December 1975.

Salaries and Wages		$ 470,246.63
Project Personnel		
Director	1	
Supervisors	2	
Police Officers	10	
Public Information Officer	1	
Records Clerk I	1	
Fuel and Lubricant		12,000.53
Miscellaneous and Supplies		7,933.04
Expert Services		112,435.00
Travel		5,382.87
Vehicle Lease		60,701.87
Police Patrol Vehicles	9	
Solo Motorcycles	4	
Miscellaneous Services & Charges		14,925.25
Capital Outlay		27,453.29
TOTAL		$ 711,078.48
Final Report Preparation		17,856.52
PROJECT TOTAL		$ 728,935.00

IV FIELD OPERATIONS

For the Tacoma STEP experimentation, the city was divided into the three areas, called Red, Yellow and Blue. These are indicated by R, Y and B, respectively in Figure 2. The areas experienced similar numbers of accidents annually and contained roughly an equal number of high-accident intersections. Experimentation was planned for the high-accident locations indicated by dots in the figure. Throughout the study, various combinations of experimental/control group assignments were made in these areas. Typically, officers concentrated their efforts heavily in one area at a time. The length of stay varied during the program.

Field operations were carefully monitored to assure that data used to evaluate a particular experiment corresponded to actual operations. In addition, field operations used were assessed in terms of creating officer work schedules for future use.

A. Officer Schedules

The method of selective enforcement used for the Tacoma study involved a combination of stationary observations at assigned high-accident locations and patrol in a general assigned area. The details of assignment varied from one experiment to another, but for each experiment high-accident locations were assigned to officers on a semirandom basis and time of observation was also assigned in this manner. Under this scheme, any effects individual officers might have on experimental results were minimized.

During the experimentation, each of the 10 STEP officers was scheduled to exercise stationary observation procedures for 4-5 hours per day at high-accident locations in an experimental area. Each experiment was conducted in no more than 20 locations in each of the three areas. Officers patrolled in a noncontrol area when not assigned to stationary observation. According to this plan, it was anticipated that accident reduction effects would be concentrated at the high-accident locations and show a general effect in the experimental area.

Each officer received a daily schedule listing the countermeasures to be exercised, the area of operation, and the exact times and locations for stationary observation. Each officer maintained a log of the exact times that he arrived and left each of his assigned high-accident locations. The schedule and log data were checked by computer to determine the degree of complicity.

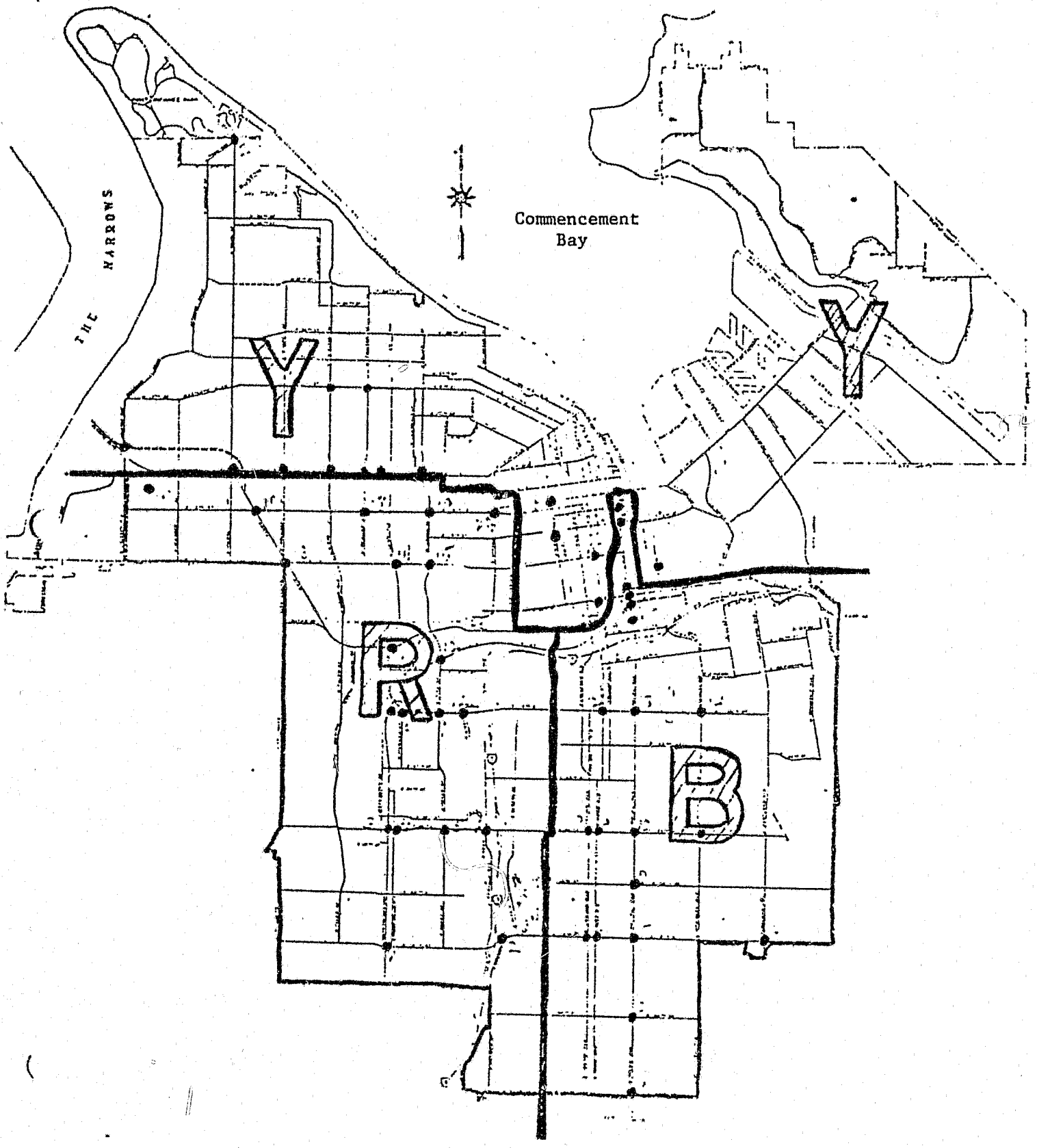


Figure 2. DIVISION OF CITY OF TACOMA FOR EXPERIMENTATION

A number of assignment combinations were used as the scheduling procedures evolved. Initially, one-hour assignments at high-accident locations were made and officers were assigned several locations in sequence. This scheduling resulted in officers becoming excessively bored due to lack of activity. Low morale became a major problem. At a study session involving all officers, the STEP administration, and the evaluator, a combination of 8 one-half hour assignments with 2 one-hour moving patrol assignments was mutually agreed upon. This schedule assured that officers never worked more than 3 half-hour stationary assignments in succession without either a one-hour lunch break or a patrol assignment. The remaining hour of the officer's 8-hour shift was required for pre-shift turnout meetings and reporting. As of early March 1974 this schedule went into effect and morale subsequently returned to a high level.

A typical daily schedule is shown below. The 'K' numbers across the top are the individual officers, 'L' indicates lunch, 'P' indicates patrol time. The numbers on the schedule indicate specific high-accident locations within a particular area.

	K-15	K-16	K-17	K-18	K-24	K-25	K-26	K-27	K-28	K-29
1100-1130	11	20	1	35	3	8	4	14	9	6
1130-1200	L	12	35	P	8	L	14	5	P	33
1200-1230	L	L	37	P	P	L	L	7	P	P
1230-1300	19	L	L	10	P	12	L	L	33	P
1300-1330	P	8	L	L	7	P	33	L	L	9
1330-1400	P	11	19	L	L	P	22	4	L	L
1400-1430	14	5	P	3	L	4	37	P	11	L
1430-1500	20	P	P	11	14	5	P	P	12	35
1500-1530	10	P	22	4	37	9	P	16	5	18
1530-1600	P	33	4	P	9	P	16	12	P	3
1600-1630	P	19	20	P	P	P	1	35	P	P
1630-1700	4	P	P	18	P	22	P	P	8	P
1700-1730	35	P	P	20	12	1	P	P	22	14
1730-1800	37	9	6	19	1	35	3	8	4	5

With this scheduling, several grids such as the one shown were prepared without high-accident location assignments. Each grid had different hours of the day assigned for patrol and lunch for each officer. Grids were matched randomly to tables of Latin Squares to make location assignments. These tables were matrices of, in this case, high-accident location numbers with no number repeated in a row or column. This assured that no officer visited the same location twice in one day and no two officers were assigned the same location at the same time. The random selection of tables of Latin Squares assured coverage of each location by a variety of officers and during all hours of STEP operation.

During the project, schedules were prepared by the evaluator. Several methods were tried, but this one was found to be both simple and accurate, with an additional advantage that neither computer assistance nor special expertise was required to create the schedules. This method can be used in normal police operations, without the assistance of an evaluator.

B. Officer-Violator Contact Training

Previously, officer-violator contact training in Tacoma had been concerned with the most efficient and courteous means to obtain the necessary information from the driver and with methods of avoiding arguments or of remaining in control should arguments develop during the process of issuing a citation. The driver's immediate or future attitudes and reactions to the contact were seldom taken into consideration. This training process had created a most efficient and businesslike ticketing system. However, no efforts were made to improve the public image of the traffic enforcement officer.

In STEP, officer-violator contact was approached with the objective of improving both immediate and long-range driver habits and attitudes.

STEP training began by having the types of officers learn to analyze various violator contacts. These sessions were led by volunteer psychologists trained in the techniques of transactional analysis. In order to better enable the officer to view an enforcement contact from the violator's standpoint, a number of officer-violator, role-playing situations were created. The instructors, in most of these situations, played the officer and the officers played the violator. As a result, the officers learned a great deal about themselves and their reactions to different communication situations and became more cognizant of other people's reactions to them. For instance, it was generally agreed that the vast majority of officer-violator contacts were, from a communications standpoint, in the area of a parent-child relationship, with the officer assuming the role of the parent or authority figure and the violator assuming the role of the child. In the role-playing situations officers became more cognizant of the fact that this relationship was extremely uncomfortable for the "child" who had been caught doing something he probably knew was wrong and who resented receiving a lecture in addition to the fine he would have to pay. A typical response in this situation was, "Just give me the ticket and get it over with."

Underlying the entire officer-violator contact training program was the idea that the traffic citation was not necessarily the desired outcome of each enforcement contact. Because of the necessity to control STEP officer's actions for evaluation purposes, it was necessary to actually identify penalty severity for specific violations. In actual operation, however, officers would be given much broader discretion and allowed to base their action on all of the factors involved in the particular traffic enforcement contact. Further, it was established that documented verbal contact would be given equal weight with the citation

for officer evaluation purposes. In addition, the STEP philosophy (particularly that most violators are essentially good drivers) was given added stress during this session.

Eventually an approach emerged from both training and subsequent field experimentation which placed primary emphasis on give-and-take communication between the officer and violator. For those enforcement contact situations, which under normal circumstances would be a citation contact, the threat of penalty was removed at the outset by the officer saying, "I didn't stop you to give you a ticket, but if you have a minute I'd like to talk with you about how you can perhaps avoid an accident in the future". The officer would then point out the violation, suggest ways to avoid committing it in the future, and briefly explain the project and its goals. Occasionally the driver would indicate that he did not have time to converse, in which case the officer would briefly explain the violation and how to avoid it. The officers found that by using this approach when it became necessary to issue a citation, they were frequently able to "sell" the citation to the violator. One officer stated that he had never before been thanked for a ticket but that it was now a common occurrence.

C. Officer Evaluation

Traditionally, one of the most difficult jobs performed by the police supervisor has been the evaluation of the effectiveness of the officers under his control. Faced with the enormity of the evaluation task, the supervisor often based his judgment on such tangible things as arrests made, calls handled, tickets written, etc. Often such matters as justification for arrests and citations made, the manner in which the officer handled himself with the public, or whether or not his actions really had an impact on crime or traffic accidents were ignored, primarily because it has always been difficult to evaluate these aspects of enforcement handling with any degree of accuracy.

In the case of the full-time traffic enforcement officer, the supervisor had primarily a single measurable item by which to judge the officer's production, i.e., citations. The officer, therefore, quickly learned that a high citation count favorably influenced the supervisor's evaluations. As a result, traffic enforcement officers were too often found working locations, which by the very nature of their physical design, invited the occurrence of traffic violations. These "duck ponds" or "cherry patches" are found in every city and are not necessarily high-accident locations. The fact that some are high-accident locations can often be attributed to engineering defects rather than to negligent driving. Therefore, no useful purpose was served by heavy citation distributions at those sites.

Another theory of officer evaluation proposed that officers be assigned to work specific high-accident locations at specific times with the understanding that they were there to prevent accidents from happening. The supervisor could then measure officer effectiveness by determining whether or not any accidents had occurred at the officer's assigned location. If not, the officer had effectively accomplished his objective. Whether or not any citations were written made immaterial, or at least secondary.

However, it was found that this method was also inefficient. Officers used the de-emphasis on tickets as an excuse to ignore violations. In a few cases, officers were observed reading books at their assignments. Officers interpreted their supervisor's unconcern regarding citations as a general lack of concern regarding violations.

During the STEP experimentation, a more viable method of officer evaluation evolved which combined the best, or at least the mose useful, portions of both evaluation theories. The preventive enforcement assignments at high-accident locations were retained, but it was also stressed that no violator was to go uncontacted. These verbal and warning contacts were counted the same as citations for evaluation purposes. By maintaining relatively close supervision to insure that the officer was actually on assigned location at the assigned time period and by following up on his contacts (officers filled out verbal contact forms and turned them in with their other citations) to insure both quantity and quality, STEP supervisors were able to conduct a more objective evaluation of their assigned personnel.

D. Enforcement Policy

At the outset of the Tacoma STEP program a specification of penalty severity for each type of violation was made. The violations were divided into three lists and copies were provided to all officers. One list contained violations for which citations were mandatory by law in the State of Washington. Another list contained violations that would always be penalized by verbal warning rather than by pay citation, during project experimentation. The penalty severity for violations on the third list was varied. Pay citations or verbal warnings were issued based on the project's experimental design. Officers were informed, on a daily basis, of the penalty severity to be utilized. The three lists of violations used in determining the penalty severity for each contact are given in Table 1. These lists were used throughout the program by STEP task force personnel only.

When a verbal warning contact was made, violators received no written reprimand and had no further obligations. At the time of the contact, the officer would discuss the STEP program and the violator's actions as they related to accident causation. The officer would then record data on the violator on a special form retained for project evaluation. This form was identical to the usual citation form, but no records were submitted to the authorities.

In the periodic review of STEP officer performance, pay citations and verbal contacts were counted equally. Officers indicated that this policy was essential for verbal contacts to be used successfully. Project supervisory personnel and officers agreed that only actual violators should be stopped for verbal contacts. It was felt that verbal contact for 'near' violations of for extremely minor infractions would create as much antagonism in the public mind as would the issuance of citations in those situations. It was also agreed that the particular

Table 1. LISTS OF VIOLATIONS; DETERMINATION OF PENALTY SEVERITY

Mandatory Citation

Throwing debris from auto
Passing stopped school bus
Disobeyed school patrol
Expired license plate or tab
No license plates (never applied)
Defective or insufficient brakes
Violating license restrictions
No license on person
Refusing to give name or address
Altered license or loaning license
Driving in violation of financial responsibility
Suspended or revoked license
Reckless driving
Negligent driving
Hit and run (unattended vehicle)
Driving while intoxicated (DWI)
Physical control while intoxicated
Hit and run (attended vehicle)
Leaving child unattended in auto
Over license capacity or no tonnage license
Excess weight, height, length or width
Unnecessary noise
Allowing unlicensed person to drive

Verbal Warning Only

Wrong way on one way street
Exceeding speed limit (EASL) 11 mph or less
Speed too fast for conditions
Failure to heed siren warning
Impeding traffic
Carrying persons or animals outside vehicle
Obstructed vision or control
Driving on shoulder or sidewalk
Spilling debris from auto
Failure to signal or improper signal
Driving while eating or drinking
Opening door into traffic
Driving without lights
Failure to dim headlights
No vehicle registration in vehicle

Varying Penalty Severity

Failure to stop at traffic or stop sign
Exceeding speed limit (EASL) 12 mph and over
Failure to yield right of way
Improper or prohibited turn
Following too closely
Wrong side of street or improper lane
Improper passing or overtaking
Breaking funeral, etc.
Disobeyed police or fire officials
Disobeyed road sign or painted white line
Improper backing
Improper lane change
Improper towing
Defective or illegal equipment
Defective or improper lights
Operate unsafe vehicle
Straddling center line

circumstances of the violation should be the predominant determining factor for the use of verbal contacts and that the personality of the driver or his past driving record should play an extremely minor role. Except for license violations and special problems, a violator's record was not obtained prior to issuing any enforcement action for either type of contact.

E. Countermeasures

During the planning stage of the Tacoma STEP, the operational time period of two and one-half years was divided into five six-month periods. In each six-month period, certain preselected countermeasures were to be tested. Some countermeasures were continually tested; others were tested only once. The five time periods were termed Experimental Phases I-V and actually lasted from 19-30 weeks each. The actual time period was adjusted to accomodate each experimental design.

Fourteen countermeasure areas were studied. These are listed on Table 2 with the phases during which they were studied, the source for evaluation of countermeasures, and results given to officers. The countermeasures are briefly discussed below.

Penalty Severity--Basically two types of penalty, pay citation and no-pay verbal warning, were imposed during experimentation. While data for the two penalty severities were analyzed in many different ways, the most enlightening evaluation was a recidivism study, tracking violators for one year following initial contact where either a citation or a verbal warning was given.

Method of Contact--STEP officers were trained extensively to make each contact, citation or verbal, a more positive experience for both officer and violator. Driver reactions to these new methods were studied.

Driver Attitude--Questionnaires were sent to violators contacted by STEP and other officers. Driver attitude toward particular officers, the STEP Program, and traffic enforcement in general were analyzed.

Visibility--As part of the experimentation, officers placed vehicles in either a highly visible mode or a less visible mode while on assignment. Accident data were measured for times during which these modes were used.

Surveillance--Early in the program, high-accident locations were alternately worked--heavily for one day and then not again for a few days. This method was compared to working all high-accident locations with equal frequency. The second method was used throughout most of the program.

Public Information--Radio, TV and news spots were also used throughout the program to provide public information about STEP. Officers as well as supervisory personnel were involved in an extensive public speaking effort. This effort was evaluated by the changing percentage of violators who were aware of STEP prior to their STEP contact.

Table 2. COUNTERMEASURES IMPLEMENTED IN TACOMA STEP

Countermeasure Area	Experimental Phases Studied	Source for Evaluation	Instructions to Officers
Penalty Severity	I-V	Traffic Accidents	Violation Lists
	III	Violator Tracing (Recidivism)	None
Method of Contact	I-V	Officer Experience	Training
Driver Attitude	V	Questionnaire to Violators	None
Visibility	I-III	Traffic Accidents	Placement of Vehicles
Surveillance	I	Traffic Accidents	None
Public Information	I-V	Violator Response	Training
Scheduling	I-V	Officer Experience	Daily Scheduling
Area Saturation	I-V	Traffic Accidents	None
Halo Effect	II-IV	Computer Model, Project Data	None
Officer Attitude	I-V	Officer Experience	None
Type of Violation	I-V	STEP Contacts	None
Court	I-V	Court Results	Court Appearance
Traffic Engineering	III	Engineering Changes	None
High-Accident Locations	I-V	Traffic Accidents, Officer Experience	None

Scheduling--Officers' time was scheduled very carefully and consistently during the program. These schedules were improved from the standpoint of officer acceptability during the program. Data on officer location were maintained by hour of the day throughout the program.

Area Saturation--STEP officers were assigned to one of three subdivisions of the city for a predetermined time period. Then, officers were similarly assigned to another area. Accident effects of STEP officer saturation of areas were statistically tested.

Halo Effects--Utilizing hourly records by officers, accidents occurring in the city were compared to STEP officer's presence in a nearby location. A computer model was developed for this study and the model could be used for other cities.

Officer Attitude--STEP officers met at the end of the program for a three-day seminar to discuss the advantages of and problems associated with implementing STEP philosophy into the traffic operation.

Type of Violation--The violations involved in contacts made by STEP officers were studied. During the program, the type of violation and penalty severity was examined for consistency and uniformity throughout the workday.

Court--All court appearance by STEP officers for contacts at STEP locations were studied. These were few in comparison to total contacts, due to the nature of the effort--daytime traffic enforcement.

Traffic Engineering--High-accident locations were reevaluated at the end of each experiment. If extensive traffic engineering improvements had been made, the location was dropped from the project and replaced by a newly selected one.

High-Accident Locations--Accidents at individual STEP high-accident locations were studied. Methods of future selection and operational problems of individual locations were evaluated.

V ANALYSIS OF EXPERIMENTAL PHASES I-V

In accordance with the experimental design as originally conceived and as it developed, the number and severity of accidents were measured and tested for differences attributable to STEP officer activity. Accident effects were analyzed on the basis of individual STEP high-accident locations and on citywide data. Times considered were both those during STEP operation (Monday-Friday, 1100-1800 hours) and for all hours and days. Other topics studied included types of violations, recidivism, collision characteristics and public information. All topics were considered from an operational standpoint and were supported by statistical material, where applicable.

A. Experimental Phases

The operational period of the Tacoma STEP began on February 12, 1973 and was completed in June of 1975. The project was planned as a series of experiments with enough flexibility to allow each new experiment to be conditioned on the last. Evaluation demands often created operation difficulties which were resolved by adjusting plans for future experiments. These operational periods that evolved, were divided into five experimental phases, each for a duration of between four and seven months, as follows:

Phase I	--	2/12/73-9/9/73,	30 weeks
Phase II	--	9/10/73-3/3/74,	25 weeks
Phase III	--	3/4/74-7/14/74,	19 weeks
Phase IV	--	7/15/74-2/2/75,	29 weeks
Phase V	--	2/3/75-6/26/75,	21 weeks

The time period of formal experimentation was often shorter, as new countermeasure techniques were tested between experiments.

1. Phase I

During Phase I, each officer was assigned to exercise stationary observation procedures at four high-accident locations per day for one hour each in the Blue area for a period of 12 weeks. Red was not entered. The experiment was designed to measure accident reduction in the Blue area with an extensive saturation period, using Red as a control area. Then, the design was repeated to measure accident reduction effects in the Red area: officers had a saturation period in the Red for another 12 weeks and Blue was not entered. The Yellow area was used throughout for unassigned patrol between stationary observation assignments. For the final six weeks, the Blue area was again used as the experimental area. This was done to repeat the first six weeks of experimentation since certain data collection and operational problems were experienced in early weeks at the outset of the operational period. During the 30 weeks,

various combinations of intersection surveillance, vehicle visibility and penalty severity were used. The experimental design is summarized below.

	12 weeks	12 weeks	6 weeks
Blue	Experimental	Control	Experimental
Red	Control	Experimental	Control
Yellow	Unassigned Patrol		

2. Phase II

Since officers had concentrated their efforts in one area at a time in Phase I, for Phase II the force was divided among the areas, i.e., the force was diluted. For 25 weeks there was at least one officer in each area, each day. Each officer was assigned to five locations per day, each for one hour, and all in the same area. Patrol between assignments was also in the same area. Penalty severity was varied on a weekly basis and high visibility was used to maximize exposure. It was intended that the effects of saturating an area and then moving to another area, Phase I, be compared to using all areas simultaneously with fewer officers per area, Phase II.

	24 weeks
Blue	Experimental
Red	Experimental
Yellow	Experimental

3. Phase III

For Phase III, the previously discussed revision of scheduling to 8 one-half hour periods was implemented. The design was similar to that of Phase I--a concentrated period of time (eight weeks) in the Red area with Blue as control and then eight weeks in the Blue area, Red control. Yellow was not entered. Unassigned patrol was in the same area as scheduled assignments. The vehicle visibility was varied as in Phase I, as well as penalty severity. It was intended that this experiment be a modification of Phase I. The operational scheme for Phase III was one which was acceptable from the officer standpoint; for Phase I, it was not. Data on Phases I and III could be combined to ascertain accident reduction effects of force concentration in an area for long periods of time. Or, data could be compared to determine whether the scheme would be as successful further along in the program as for the initial STEP operations.

	8 weeks	8 weeks
Blue	Control	Experimental
Red	Experimental	Control
Yellow	Control	

4. Phase IV

In Phase IV, a new experimental design was used. Since Phases I-III had operations in an area for long periods of time and since the experimental and control possibilities of the three areas had not been fully utilized, Phase IV operations concentrated in an area for considerably shorter periods of time and all three areas were used in sequence as experimental. The other two areas served as post-experimental and cleansed controls. The procedure was repeated once, followed by a period in which each area was saturated for three days only, and areas were saturated in succession. Officers were assigned 8 one-half hour periods of stationary observation as in Phase III. Penalty severity was again studied in this phase.

	3 weeks	3 weeks	3 weeks	9 weeks	10 weeks
Blue	Control	Control	Experimental	Repeat	3 days per area
Red	Control	Experimental	Control		
Yellow	Experimental	Control	Control		

5. Phase V

During Phase V verbal contacts were made for all but flagrant violations. Officers continued using 8 one-half hour location assignments. The Red and Blue areas were used only, as alternating experimental and control areas for four weeks each. A special assignment in the Blue area was made: A major thoroughfare, Pacific Avenue, was assigned heavily, shifting officers back and forth along the street. This experiment was designed to test an operation which was most desirable to officers, under the assumption that a four week saturation and shift with special concentration on the highest accident rate street would provide maximum coverage and possible halo effects.

	4 weeks	4 weeks	4 weeks	4 weeks
Blue	Experimental	Control	Experimental	Control
Red	Control	Experimental	Control	Experimental
Yellow	Control			

B. STEP Data Collection

During the operational time periods of the Tacoma STEP, daily data were collected on the following events:

	STEP Locations* Only		Other Locations	
	Involving STEP Officers Only	Involving All Other Officers	Involving STEP Officers Only	Involving All Other Officers
Hours During STEP Activities	Accidents Contacts Court Follow-Up	Accidents Contacts	Accidents	Accidents
Other Hours	Accidents	Accidents	Accidents	Accidents

*STEP locations referred to the high-accident locations to which officers were assigned stationary observation.

Baseline data on accidents and citations for one year were also collected.

Data variables available for use in statistical evaluation are given below:

Accidents

- Time
- Location
- Date
- Police Unit Involved
- Arrests, Citations
- Accident Injury Severity
- Type of Collision
- Number of Vehicles Involved
- Number Killed, Injured
- Causative Violations
- Light, Weather, Traffic Conditions
- Visual Obscurements
- Alcohol Involvement
- Driver's Residence, Age, Sex
- Recidivism

Contacts

- Time
- Location
- Date
- Police Unit Involved
- Arrest, Citation, Warning, Verbal
- Accident Involvement
- Type of Violation
- Light, Weather, Traffic Conditions
- Alcohol Involvement
- Driver's Residence, Age, Sex
- Violator's Knowledge of STEP

Court Follow-Up

- Data on Contact
- Actual Charge
- Type of Court
- Plea, Court Action
- Driver's License Withdrawal
- Fine, Term, Modifier
- Number of Days to Trial

Countermeasures

- Types of Surveillance, Visibility, Penalty, Patrol
- Experimental Areas Used
- Actual Time Spent at Each Location
- Scheduled Time for Each Location
- Driver Attitude Questionnaire Response

C. Enforcement Effort

In the evaluation of this special enforcement program, changes in total enforcement which were not related to STEP must be examined. The fact that additional officers were added to the Tacoma police force under STEP and other changes in the traffic division occurred could produce effects, independent of any particular STEP-related activities.

1. STEP Enforcement

At the outset of STEP in February of 1973, 10 new officers were added to the traffic enforcement detail in Tacoma for STEP. Man-hour, schedule and contact information was maintained for all STEP locations during the hours that STEP officers were in stationary observation. This information is summarized in Table 3 for the entire period of experimentation. Data on the first two weeks of operation were not entirely maintained and, thus, are not included. Holidays, training sessions, etc., where the whole task force was not in the field are excluded from the table; however, vacation and, illness are included. Table 3 shows that 24 to 31 contacts were made each day at these locations by STEP officers. Additional contacts, citation and verbal, were made by STEP officers during patrol hours at other locations in an experimental area and these are not shown in the table.

Table 3. CONTACTS AT STEP LOCATIONS BY STEP OFFICERS WHILE IN STATIONARY OBSERVATION ENVIRONMENT

Man-Hours, Schedules	Blue Area	Red Area	Yellow Area
Phase I			
Actual days in area	79 Days	58 Days	
Hrs/day stationary	4 Hrs	4 Hrs	NO
Officers in area	20 Officers	10 Officers	STATIONARY
Contacts/day	25 Contacts	25 Contacts	OBSERVATION
Phase II			
Actual days in area	114 Days	114 Days	114 Days
Hrs/day stationary	5 Hrs	5 Hrs	5 Hrs
Officers in area	3-4 Officers	3-4 Officers	3-4 Officers
Contacts/day*	12 Contacts	10 Contacts	9 Contacts
Phase III			
Actual days in area	40 Days	42 Days	
Hrs/day stationary	4 Hrs	4 Hrs	NO
Officers in area	10 Officers	10 Officers	STATIONARY
Contacts/day	27 Contacts	21 Contacts	OBSERVATION
Phase IV			
Actual days in area	44 Days	44 Days	50 Days
Hrs/day stationary	4 Hrs	4 Hrs	4 Hrs
Officers in area	10 Officers	10 Officers	10 Officers
Contacts/day	30 Contacts	31 Contacts	30 Contacts
Phase V			
Actual days in area	55 Days	41 Days	
Hrs/day stationary	4 Hrs	4 Hrs	NO
Officers in area	10 Officers	10 Officers	STATIONARY
Contacts/day	24 Contacts	27 Contacts	OBSERVATION

*Based on one-third as many officers per area as other phases.

2. Other Enforcement in Tacoma

About six months after STEP operation began, seven traffic officers along with their responsibilities in accident investigation and traffic enforcement, were transferred to the Patrol Division where their primary emphasis was on crime-related functions rather than traffic. The shift of responsibility in non-STEP enforcement during 1973 can be seen on the table below.

Table 4. NUMBER OF TRAFFIC CITATIONS IN TACOMA, NON-STEP OFFICERS

	1972	1973	1974	1975*
Traffic Officers	34,983	26,451	20,354	7,795
Patrol Officers	7,783	8,581	8,315	3,484
Other Officers	1,021	1,415	2,606	1,847
Total	43,787	36,447	31,275	13,126

*Data to 6/30/75 only (6 months)

If the 1975 data are extrapolated to estimate the total year, the number of arrests, citations and written warnings after 1973 can also be seen to decrease overall in the city. This occurred because of a general de-emphasis on citations, as STEP research indicated that other methods were equally effective. The total number of contacts (verbal included) for STEP officers did not decrease, as shown in Table 3.

3. Contacts at STEP Locations, (Mon-Fri, 1100-1800 Hrs)

Other officers occasionally made enforcement contacts at STEP locations during STEP hours of operation. Only records of citations and written warnings were available from these non-STEP contacts. The total number of recorded contacts by both STEP and non-STEP officers for these locations and times are also shown in Table 5.

Table 5. CONTACTS AT STEP LOCATIONS DURING STEP OPERATIONS

	Number of Contacts			
	Blue	Red	Yellow	Total
STEP, Phase I	2,002	1,428	--	2,430
STEP, Phase II	1,348	1,173	1,036	3,557
STEP, Phase III	1,086	883	--	1,969
STEP, Phase IV	1,316	1,349	1,519	4,184
STEP, Phase V	1,315	1,092	--	2,407
	7,067	5,925	2,555	14,547
Other Officers, Phases I-V	1,110	759	1,114	2,983
Total	8,177	6,684	3,669	17,530

The percentages by severity of penalty for these contacts are shown in Table 6.

Table 6. STEP CONTACTS BY SEVERITY OF PENALTY (All Officers, Phases I-V)

	Percentage of Contacts		
Penalties	Blue	Red	Yellow
Arrest	1	1	1
Citation	33	30	41
Warning	14	14	14
Verbal	52	55	44
	100	100	100

The percentage of verbal contacts in the Blue and Red areas are high, because verbal contacts were made in these areas for all but mandatory citations during Experimental Phase V.

Since STEP officers were instructed to contact violators for hazardous violations, particulary those deemed "accident-related" and since the type of penalty varied for certain violations depending on the experimentation, it was of interest to examine the proportion of STEP effort which actually was devoted, throughout the program, to each type of violation. (See Table 1, page 21 for those violations varying in penalty severity.) These proportions are shown in Table 7.

Table 7. PERCENT OF VIOLATIONS BY TYPE

	Phase I	Phase II	Phase III	Phase IV	Phase V
Blue Area					
Fail to stop; disobeyed other signs	36	34	28	21	16
Speeding violations	20	17	13	20	34
Defective equipment	16	22	29	35	30
Right of way violations	12	8	8	7	5
Licensing violations	7	8	8	9	8
Other violations	9	11	14	8	7
	100	100	100	100	100
Red Area					
Fail to stop; disobeyed other signs	32	30	22	18	15
Speeding violations	22	27	24	25	39
Defective equipment	17	17	29	34	27
Right of way violations	8	8	6	6	6
Licensing violations	8	7	9	7	6
Other violations	13	11	10	10	7
	100	100	100	100	100
Yellow Area					
Fail to stop; disobeyed other signs	NO	26	NO	18	NO
Speeding violations	STATIONARY	29	STATIONARY	20	STATIONARY
Defective equipment	OBSER-	20	OBSER-	37	OBSER-
Right of way violations	VATION	8	VATION	5	VATION
Licensing violations		6		9	
Other violations		11		11	
		100		100	

Contacts made by STEP for defective equipment violations showed an increase for Phases III and IV. Officers were instructed to concentrate on other violations for Phase V. The decrease in defective equipment contacts was seen in Phase V. An increase in speeding violations was seen in Phase V, when verbal warnings were extensively used. It is particularly interesting to note the marked decrease in fail to stop and right of way violations at STEP locations during the project.

For STEP, it was essential that verbal or citation contacts be given under identical traffic situations, with penalty severity varying only according to experimentation. Table 8 shows the penalty for all contacts in the Blue and Red areas which were used in the experimentation throughout the program. The data show that verbal contacts were made equitably each hour of STEP, but more verbal contacts were made in light traffic.

Table 8. COMPARISON OF ARRESTS, CITATIONS AND WRITTEN WARNINGS TO VERBAL CONTACT

Time of Day		Arrests, Citations, Warnings (percent)	Verbal Contact (percent)
Blue	1100-1200	14	14
	1200-1300	12	11
	1300-1400	11	12
	1400-1500	12	14
	1500-1600	17	18
	1600-1700	17	15
	1700-1800	17	16
		100	100
Red	1100-1200	13	15
	1200-1300	11	11
	1300-1400	10	11
	1400-1500	12	13
	1500-1600	17	19
	1600-1700	19	15
	1700-1800	18	16
		100	100
Traffic			
Blue	Light	12	18
	Medium	61	56
	Heavy	27	26
Red	Light	17	24
	Medium	59	55
	Heavy	24	21

4. Court Cases Involving STEP Officers

Every time a STEP officer appeared in court for a STEP location violation, data were collected on the outcome. There were 358 such cases which originated during Phases I through V. Over 80 percent of these cases came to court within 60 days of the violation. Shown on Tables 9 and 10 are the violations involved, number and percent of officer appearance in court, fines and terms.

Table 9. COURT CASES BY RESULTS

Court Results	Number of Offenders
Fine	154
No Fine	78
Term Suspended (No fine, fine and/or school)	37
Bail Forfeiture	37
No Fine, School	16
Failed to Appear, Warrant Issued	31
Term (Fine or no fine)	5
TOTAL	358

Table 10. COURT CASES BY TYPE OF VIOLATION

Traffic Violation	Number of Violators Contacted	Number of STEP Officer Appearances in Court	Percent of Officer Appearances in Court
Disobeyed Stop or Other Road Sign	4662	88	2
Licensing Violations	1452	110	8
Speeding; Speed too Fast for Conditions	4304	56	1
Defective Equipment	4890	40	1
Right of Way Violations	1375	24	2
Reckless, Careless,* Negligent Driving	151	8	5
Driving While Intoxicated *	7	2	29
Other Moving Violations	1361	21	2
Miscellaneous	357	9	3
Total	18559	358	2

*While these violations required a mandatory court appearance on the part of the violator, a plea of guilty or a stipulation to a reading of the record did not require officer appearance in court.

D. Traffic Accidents

In this section of the report the measurement of accident reduction effects of STEP are discussed. The overall numbers of accidents in the city since STEP began, the types of accidents which have occurred and accident differences in experimental versus control situations during STEP are also addressed.

1. Citywide Accident Statistics

The city of Tacoma had experienced a rather stable accident rate prior to STEP. The number of accidents annually for the 1972 baseline period, before STEP, are compared in Table 11 to the corresponding accident statistics for 1973-1974 and for the first half of 1975, during STEP operations.

Table 11. NUMBER OF ACCIDENTS IN TACOMA BY CALENDAR YEAR

	Before STEP	During STEP		
	1972	1973	1974	1975*
Total Accidents	3906	3854	3985	2079
Accidents with Casualties	1044 (27%)	1158 (30%)	859 (22%)	452 (22%)
Accidents with Fatalities	21 (.5%)	14 (.4%)	20 (.5%)	10 (.5%)

*Data to 6/30/75

It should be noted that the injury severity code and reporting procedures were in the process of being revised during late 1973. This may account for first the increase and then the decrease in percent of injury accidents shown during STEP. Total accidents for 1972, 1973 and 1974 show stable accident experience which was previously seen in the city's computer recorded history (since 1963).

For the time period of interest to the project, February 2, 1973, start of Phase I, to June 30, 1975, end of Phase V, the total number of accidents is shown in Table 12 by experimental phase.

Table 12. NUMBER OF ACCIDENTS IN TACOMA BY EXPERIMENTAL PHASE

	1972	1973	1974	1975	
For the Year	3907	3854	3985	2079*	
Experimental Phase I		I 2049			
Experimental Phase II		II 1976			
Experimental Phase III			III 1379		
Experimental Phase IV			IV 2379		
Experimental Phase V				V 1637	

*Data to 6/30/75

Since the length of experimental phases varied, these data merely indicate that each experimental phase had sufficient accidents, citywide, for analysis. The average number of accidents occurring per week during each phase are given in Table 13. The averages are also provided for each of the three areas of the city. Again, stable accident experience is shown within the city.

Table 13. AVERAGE NUMBER OF ACCIDENTS PER WEEK, ALL HOUR & DAYS

Area of City	Experimental Phase					
	1972	I	II	III	IV	V
Blue	24	20	24	24	27	26
Red	20	19	23	19	22	21
Yellow	31	19	33	30	34	33
Total City	75	68	79	73	83	80

For the areas used in the experimentation, (both experimental and control) the average number of accidents per week are shown on Table 14 for STEP operation hours and days, only.

Table 14. AVERAGE NUMBER OF ACCIDENTS PER WEEK, STEP HOURS AND DAYS ONLY

Areas Used for Experimentation	Experimental Phase				
	I	II	III	IV	V
Blue	6.0	6.5	9.1	6.9	8.7
Red	5.8	7.3	6.9	5.0	8.3
Yellow	---	9.7	---	9.0	---

The percent of accidents, citywide for STEP days and for STEP hours are shown on Table 15, before STEP (1972) and for each phase.

Table 15. PERCENT OF ACCIDENTS BY DAYS AND HOURS

	1972	Phase I	Phase II	Phase III	Phase IV	Phase V
Day of Week						
Mon-Fri (STEP)	71	72	71	72	72	72
Sat-Sun (no STEP)	29	28	29	28	28	28
	100	100	100	100	100	100
Time of Day						
1100-1800 (STEP)	47	44	40	44	43	46
Other (no STEP)	53	56	60	56	57	54
	100	100	100	100	100	100

Accidents during these days and hours do not appear to have sustained any significant percentage reduction.

2. Types of Accidents

The characteristics of accidents in Tacoma were studied so that any possible shifts might be detected which could be attributed to STEP. Percentage distributions were computed for 1972 and for each experimental phase in Tables 16 - 18.

Table 16. PERCENT OF ACCIDENTS BY COLLISION TYPE

	1973	Phase I	Phase II	Phase III	Phase IV	Phase V
Accident Type						
Right Angle	31	31	31	32	30	33
Rear End	15	16	13	13	15	13
Parked Car	16	18	20	18	20	18
Turning Movement	12	10	11	11	10	12
Hit Object	10	9	9	8	10	9
Sideswipe	5	6	5	6	5	5
Parking/Backing	4	3	4	5	3	4
Pedestrian	3	3	3	3	3	3
Head On	2	1	1	1	1	1
Other	2	3	3	3	3	2
	100	100	100	100	100	100
Number of Vehicles Involved						
One	14	14	14	13	14	13
Two	79	78	79	79	79	80
Three or more	7	8	7	8	7	7
	100	100	100	100	100	100

No changes are noted.

Table 17. PERCENT OF ACCIDENTS BY INJURY SEVERITY

Injury Severity	1972	Phase I	Phase II	Phase III	Phase IV	Phase V
Fatal	<1	<1	<1	<1	<1	<1
Injury	26	29	30	22	20	22
Property Damage	73	71	70	78	80	78
	100	100	100	100	100	100

There was some question as to the validity of the injury severity data because of the previously mentioned code modification. Therefore, any shifts in injury severity are questionable.

Table 18. PERCENT OF ACCIDENTS BY AREA

Area of Accident	1972	Phase I	Phase II	Phase III	Phase IV	Phase V
Blue	32	30	30	33	33	32
Red	26	28	29	26	26	26
Yellow	42	42	41	41	41	42
	100	100	100	100	100	100

No marked changes in distribution of accidents by area of the city are shown.

3. Analysis of Experiments

In accordance with the experimental design, statistical tests for STEP effects were made on the accident data. A series of tests were made for various experimental/control, before/after situations. In all cases, a 2-way analysis of variance was used to compare the number of accidents which occurred during different STEP-related activities. The F-tests used for the analysis of variance considered differences between the Red, Blue and Yellow areas. The countermeasure areas of area saturation, surveillance, visibility and penalty severity were examined via this type of testing.

a. Area Saturation

Using control and experimental areas, four sets of data were used for testing saturation effects:

1) All accidents in the city
2) All fatal and injury accidents in the city
3) All accidents, M-F, 1100-1800
4) All fatal and injury accidents, M-F, 1100-1800

Data were grouped so that comparison groups of experimental/control or before/after situations involved exactly the same days of the week and hours of the day. An adjustment of no more than two days was made, where necessary, to create equal time periods for testing comparison groups. For the analysis, only the areas used in the experimentation were tested; i.e., Red and Blue for Experimental Phases I and III and V; and Red, Blue and Yellow for Phases II and IV.

For Phase I tests, the data used started on the seventh week of actual operations so that 6 weeks Blue--12 weeks Red--6 weeks Blue were successive experimental times and areas. The two time periods that Blue was experimental were combined. Officers had 4 one-hour stationary assignments in Blue and Red during Phase I.

For Phase II, the first week of experimentation was excluded for testing since the Yellow area was used alone to familiarize officers with new locations in that area. Each officer had 5 one-hour stationary assignments in one of the three areas, Red, Blue or Yellow. All three areas were used concurrently.

For Phase III, three weeks of the time period were excluded for testing, as STEP was not in operation during those weeks. Stationary assignments were in the Red and Blue areas, eight for one-half hour each. This stationary assignment scheme was continued for Phases IV and V. Red and Blue were each experimental and alternating control.

For Phase IV, the first week was excluded for testing since new locations used in the Red and Blue areas were tried. Each area was used several times in succession.

For Phase V, the first week was excluded since new Pacific Avenue locations were being tried in the Blue area. The last four weeks of experimentation were excluded as the design had already been completed. Red and Blue only were used.

The five experimental phases were organized according to the saturation by STEP in experimental areas. Six time periods were used for tests organized under three general categories of area saturation:

Time Period Used in Testing		Area Saturation
1.	Phase I	6-12 successive weeks in experimental area (Experimental-Control)
2.)	Phase III	
3.	Phase IV-1*	3-4 successive weeks in experimental area (Experimental-Control)
4.	Phase V	
5.	Phase II versus 1972	Essentially city-wide (Before-After)
6.	Phase IV-2* versus 1972-3	

Data were combined according to whether the area of occurrence was experimental or control at the time or, if no concurrent controls were clearly used; "before" was used as control (previous year or two years previous). Thus, the basic analysis of variance was on Experimental versus Control with "color" of area as a second variable.

---

*Phase IV-1 refers to the first half of Phase IV when experimental areas were worked for three weeks in succession; Phase IV-2 refers to the second half, where three days were spent in each experimental area, or, essentially citywide.

Each of the six time periods was tested four times, using each of the data sets. The number of accidents used for each data set of each test are given in Table 19. E and C notations on the table refer to experimental and control, respectively; and R, B, and Y refer to the Red, Blue, and Yellow areas, respectively.

An example may aid the reader. Reading Table 19, during Phase I, the Blue area had 242 accidents while it was experimental and 211 while it was control. The number of fatal and injury accidents was 72, experimental; and 65, control. For STEP operation hours and days, Blue had 80 accidents when experimental (26 fatal or injury) and 63 accidents when control (19 fatal or injury). The statistical test is comparing accidents in experimental times for Blue and Red to accidents in control times for these areas.

In all of these 24 tests, no differences could be detected at the .05 level between experimental and control situations. One test did pass at the .10 level--Phase IV-2, all accidents, essentially citywide. The data showed more accidents during the experimentation than the before-STEP control. Considering the inconsistency of this test among all tests, one must conclude from these data that no statistically significant accident reductions were seen for the experiments.

Other tests were made, comparing phases to each other and combining similar experiments; but, as one would expect, results were the same. Preliminary tests, early in the project, were made for Phases I-III which utilized the exact hours that STEP was in operation, i.e., excluding holidays, training sessions, etc.; but results were again the same.

b. Surveillance and Visibility

For each week of operation during Phases I-III a countermeasure assignment of surveillance and visibility was made. As the project evolved, the countermeasures of surveillance and visibility had decreasing emphasis. Countermeasure variations for experimental testing are described here as they were set forth in project planning.

Surveillance Countermeasure Definition

Continuous--A high accident intersection was under surveillance continuously, for the predominant time period of accidents.

Table 19. TEST DATA FOR AREA SATURATION

	Number of Accidents Per Area in Time Period							
	All Hours & Days				STEP Hours & Days			
	All Accidents		Fatal & Injury Only		All Accidents		Fatal & Injury Only	
Phase I 6-12 Weeks Per Area	E	C	E	C	E	C	E	C
B	242	211	72	65	80	63	26	19
R	208	238	63	76	60	80	19	30
Y	-	-	-	-	-	-	-	-
Phase III 6-12 Weeks Per Area	E	C	E	C	E	C	E	C
B	223	184	56	32	80	66	15	9
R	151	172	301	29	46	64	7	9
Y	-	-	-	-	-	-	-	-
Phase IV-1 3-4 Weeks Per Area	E	C	E	C	E	C	E	C
B	196	123	51	18	63	31	11	6
R	120	89	26	32	32	28	7	9
Y	160	239	31	37	48	90	7	15
Phase V 3-4 Weeks Per Area	E	C	E	C	E	C	E	C
B	221	195	47	48	72	58	13	17
R	172	168	31	32	66	58	13	8
Y	-	-	-	-	-	-	-	-
Phase II Essentially Citywide (1972 Control)	E	C	E	C	E	C	E	C
B	570	610	174	165	156	189	48	48
R	538	530	170	133	176	182	54	56
Y	786	721	234	182	233	273	66	71
Phase IV-2 Essentially Citywide (1972-73 Control)	E	C	E	C	E	C	E	C
B	296	239	57	56	100	71	20	16
R	240	226	42	53	79	80	12	24
Y	330	289	65	75	113	120	21	33

Spot--A high accident intersection was under surveillance for some part of that predominant time period of accidents.

Visibility Countermeasure Definition

High--STEP vehicles would be seen by all drivers approaching a high-accident intersection.

Low--STEP vehicles would be only seen by drivers on one approach to a high-accident intersection.

At the top of each officer's schedule for a week would be, for example, "Spot, High". "Spot" would indicate that the officer may or may not expect to relieve another officer at a location. (Under continuous surveillance a location selected for a given day was constantly worked in high-accident hours.) "High" would direct him to position his vehicle so that it was visible to as many drivers as possible.

The continuous alternative for the surveillance countermeasure proved to be quite difficult to implement. A few STEP locations were selected at random each day and schedules had to be constructed so that one officer was present during all of the high-accident hours--7 hours for certain locations and 4 for others. Scheduling this, combined with patrol and lunch hour allocations, was a difficult task. On the other hand, the scheduling of spot surveillance was simple--essentially random assignments. Analysis based on Phase I accidents for spot versus continuous weeks showed no consistent differences between the two, thus it was decided that spot coverage would be used exclusively for Phases II-V.

For this analysis, weeks were separated according to whether spot or continuous surveillance was used. Weeks were recombined according to surveillance and accident data were tested for experimental areas only, spot weeks versus continuous weeks. The analysis of variance methods were the same as that used for area saturation, with comparison groups of spot versus continuous and accounting for differences in the experimental areas. This type of analysis was also used to compare high versus low visibility.

Accident data on Phases I and III, where high and low visibility were varied in a controlled manner, were used to test accident effects of visibility. Phases I and III were tested separately and together. Although no differences could be substantiated at any reasonable level of significance, it was decided that the high profile mode would be used for remaining Phases IV and V. The decision was based on the fact that experimental areas showed slightly fewer accidents in hours of STEP operation during the high

profile mode in both Phase I and Phase III. And, further, high profile provided an opportunity to influence the noncontacted violator (by sight of the vehicle) and would perhaps be more likely to produce halo effects.

c. Penalty Severity

For each week of operation a countermeasure assignment of penalty severity was made along with surveillance and visibility assignments. Countermeasure variations are listed below as set forth in project planning.

Penalty Countermeasure Definition

Citation--Citations to be given for all violations subject to experiment.

Warning--Written warning citations to be given for all violations subject to experiment.

Verbal--Verbal warnings to be made for all violations subject to experiment.

Under this countermeasure, the penalty for violations listed as "varying penalty severity" would be totally dependent on the weekly countermeasure assignment. During Phase I, all three penalty severity alternatives were varied on a weekly basis. For Phases II-IV only citation and verbal were used to strenghten the comparison of alternatives. For Phase V the countermeasure policy was verbal only for these special violations.

Statistical analysis of accident data comparing weeks of citations, warning and verbal, were similar to that for surveillance and visibility, and conflicting results were obtained, phase by phase. Phase I showed fewer accidents in written warning weeks, Phase II in verbal warning weeks, and Phase III in citation weeks. During Phase IV, the concept for evaluation of penalty severity was revised. The original experimental design for measuring effects related to the type of penalty associated with contacts was clearly inapplicable.

Since penalty severity was changed weekly, the experimental design would indicate that accidents for a "verbal week" be associated with the verbal alternative of the countermeasure. This eliminated the possibility that the severity of penalty affects the violator for any length of time after the contact and included the assumption that other drivers were aware of the current penalty severity.

For example, if Driver A received a verbal contact, it is unlikely that this event would affect noncontacted Driver B, who became involved in an accident during the same week.

Alternatively, it may have influenced Driver A's behavior during the next week, which would be termed a "citation week".

Considering these deficiencies in previous logic, the penalty countermeasure was pursued differently for final analysis--selected drivers who were contacted and given either a verbal warning or a citation during Phase IV were tracked for a one-year period to ascertain the effects on future driver behavior of the two methods of contacting violators. The results of this recidivism study will be discussed in section V-E of this report.

Since the sample for tracking had been selected by the end of Phase IV, it was decided that verbal warnings would be used exclusively for the final experimental phase, Phase V. This was the first time that the verbal warning penalty severity countermeasure had been used for an extended time period. Accident rates for Phase V did not increase or decrease with this countermeasure (see Table 13, page 37).

4. STEP and Non-STEP Location Zones

STEP efforts were further analyzed by comparing accident locations to STEP officer locations for various time periods (by phase, month, week, day, hour). Accident data were maintained by the city in hourly increments and by the nearest intersecting streets. In addition, each STEP officer maintained a daily log of the exact times that he arrived and left each of his assigned high-accident locations. These logs provided a means for tractable monitoring of the experimentation.

Comparing these two items of information--STEP officer presence in stationary observation and accidents--located both in time and in position, the possible effects of this enforcement on accidents could be postulated and supported. For this comparison, the city was divided into about 130 operational, traffic flow oriented zones. All accident locations and STEP officer locations appearing in the data were assigned to an appropriate zone for each hour of each day during the experimentation.

The first step toward creating these zones was to identify all high-accident locations and boundaries for the three experimental areas and designate them on a map of the city. Since officer assignment to STEP locations was the crux of the experimentation, special zones called STEP zones were constructed first. These zones were generally defined by taking about two city blocks in all directions from the STEP locations. Zones varied slightly; e.g., streets with no entry to or from STEP locations were excluded. Some zones contained more than one STEP location due to the proximity of one high-accident location to another. Intersections in a STEP zone were always entirely within the same experimental area--Red, Blue or Yellow.

Next non-STEP zones were constructed for the study of halo effects (see page 51 for discussion of halo effects). In particular, zones were constructed which geographically adjoined STEP zones, but were not STEP zones themselves. These zones generally had about the same number of intersections as STEP zones and followed major traffic flow from STEP locations.

STEP zones were first studied according to the experimental phases during which they were used. At the end of Phase III, STEP locations were reevaluated because of traffic engineering changes which had been made. ALso, during Phase V special STEP locations were used on one street, Pacific Avenue. STEP zones had been keyed to accomodate these two changes. The zones containing "active" STEP locations were identified with each experimental phase. Then, the average number of accidents per month according to the "active" or " nonactive " status of the zone was computed. (See Table 20) This was done to determine whether or not high-accident locations would show regression to the mean effects.*

Table 20. AVERAGE NUMBER OF ACCIDENTS PER MONTH FOR STEP ZONES AS THEY WERE USED

Zones	1972	Phases I-III	Phase IV	Phase V
Having STEP locations which were used throughout the study	45	32	45	28
Having STEP locations which were no longer used after Phase III	13	10	16	10
Having STEP locations which were added after Phase III	9	11	11	11
Having Special locations used for Phase V experimentation on Pacific Avenue	4	3	4	2
All STEP zones	71	56	76	51

▨ = zone "active" in experimentation

Regression to the mean effects are not evident.

The special study during Phase V on Pacific Avenue, one of the city's major throughways, deserves further mention. Figure 4

*Regression to the mean - Phenomenon that, assuming the number of accidents at all locations are independent, identically distributed, the locations with high accident experience in one year will tend to regress to the mean in the following year.

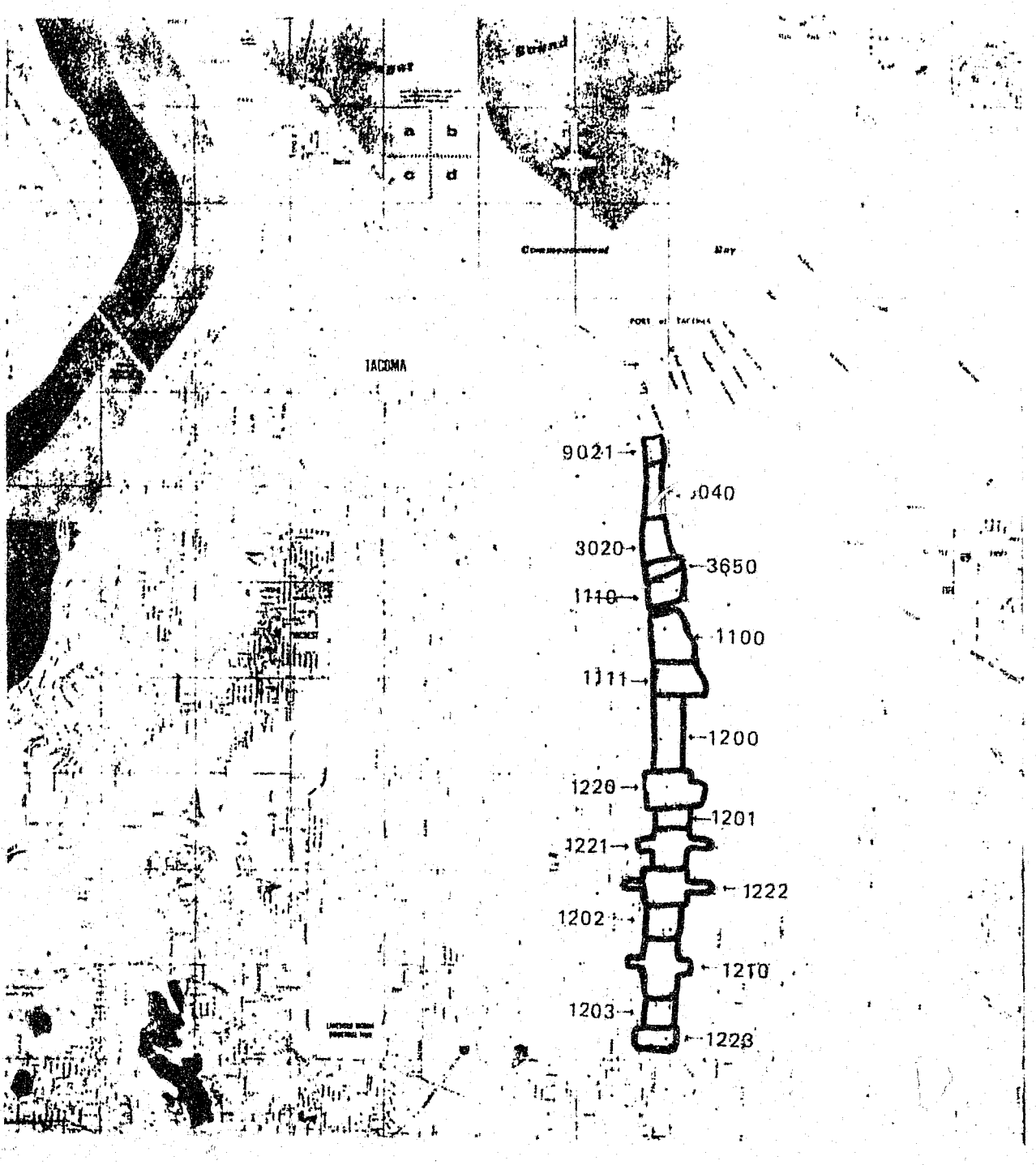


Figure 4. NUMBERED ZONES ON PACIFIC AVENUE

shows the numbered zones on Pacific Avenue. The average number of accidents per month on Pacific Avenue are shown on Table 21 which also gives the averages for accidents by zone, and the active or nonactive status.

Table 21. ACCIDENTS ON PACIFIC AVENUE

Pacific Avenue Zone Number	Average Number of Accidents per Month for Pacific Avenue Zones			
	1972	Phases I-III	Phase IV	Phase V
9021	5.7	2.5	7.7	3.9
3040	5.8	4.0	8.9	3.4
3020	3.3	2.6	7.0	3.0
3650	3.9	2.8	6.7	2.9
1110	2.2	1.3	2.6	.9
1100	.9	.8	2.1	.9
1111	3.4	2.2	5.6	2.0
1200	4.1	4.3	3.3	4.5
1220	4.4	2.9	5.1	2.1
1201	.8	.6	2.3	.7
1221	.8	.8	.4	.5
1222	2.7	1.7	7.7	2.9
1202	.8	.4	2.1	.4
1210	3.2	1.8	3.5	2.8
1203	.3	.3	.9	.4
1223	1.7	1.1	1.6	1.1
Total	43.0	27.1	67.5	33.4

 = Zone "active" in experimentation

Accidents appear to be somewhat more sensitive to enforcement than on the previous table; i.e., during Phase IV when there were fewer active zones on Pacific Avenue, accidents increased; and in Phase V, when new Pacific Avenue active zones were added, accidents decreased.

These topics--accident increase and decrease over time with varying enforcement and accident effects in localized areas--are examined more precisely in the next two sections of this report, "Time Series Analysis" and "Halo Effects."

5. Time Series Analysis

Total accidents occuring in the city are shown by month of the year (Table 22). Phases are indicated by circled Roman numerals, to the left of the starting month. Fatal and injury accidents are shown in parentheses.

Table 22. NUMBER OF ACCIDENTS BY MONTH AND YEAR

Month	1972	1973	1974	1975
Jan	301 (75)	313 (66)	314 (78)	369 (67)
Feb	277 (68)	I 282 (76)	256 (55)	318 (55)
Mar	360 (86)	346 (107)	III 323 (77)	356 (61)
Apr	335 (76)	284 (92)	307 (57)	350 (61)
May	274 (73)	306 (98)	329 (62)	342 (82)
Jun	320 (90)	297 (73)	298 (84)	344 (104)
Jul	327 (96)	258 (72)	IV 317 (67)	
Aug	310 (97)	310 (81)	300 (63)	
Sep	349 (100)	II 315 (104)	337 (80)	
Oct	286 (82)	343 (122)	341 (62)	
Nov	373 (91)	389 (138)	420 (93)	
Dec	395 (109)	411 (109)	443 (81)	
	3907	3854	3985	

During the time period in which nationwide statistics have shown reduced rates (late 1973 through mid-1974), decreases were not extensive within the city itself.

Monthly rates for the city do not show accident reduction over time, but during most of the project experimentation, STEP officers were concentrating their efforts in only one of the three areas in the city for at least one week at a time. To further clarify the issue of accident rates over time the National Highway Traffic Safety Administration (NHTSA)* made an interesting analysis using the accident and enforcement history by zone. NHTSA studied the number of accidents per week in the Red area as a function of the number of STEP locations visited during stationary observations per week. Data used were for Phase I (4 one-hour assignments per day per officer, 10 officers when experimental, 0 when control), Phase II (5 one-hour assignments per day per officer, 3-4 officers at all times) and Phases III and IV (8 one-half hour assignments per day per officer, 10 officers when experimental, 0 when control).

The method used for the analysis was the Box-Jenkins technqiue of time series. This technique allows the user to build a mathematical model describing the movement of the time series (accidents per week) so that he may forecast its movement in the future based upon relationships existing in the past. One application of this approach is to develop a model of a given activity during a baseline period and use the model to forecast expected results in an experimental period. Comparing the actual experimental results with the forecasted results, differences noted may be attributable to the countermeasures introduced as part of the experiment,

*Proceedings of the Motor Vehicle Collision Investigation Symposium, 1975, "Data Collection & Analysis in Safety Demonstration Programs," Terry Klein and Paul Levy, to be published.

provided other corroborative evidence can be obtained. Confidence bounds on the forecast can be developed to determine the significance of the comparison, forecast versus actual. A multivariate approach was used in this application: the accident time series was related to the enforcement time series by use of a transfer function.

Figure 5 shows the time series data for the number of actual STEP location visits, per week in the Red area. The experimental phases and week of operation are also shown. Figure 6 shows the number of fatal and injury accidents occurring during the same 77-week period. Property damage crashes were eliminated by NHTSA.

The transfer function model derived from these data is

$$(1 + 1.80B + .96B^2)\ Y_t = -.0028\ X_{t-1} + \frac{n_t}{(1 - .97B + .34B^2)\ (1 - .63B)}$$

Where Y_t = number of accidents occurring in time period t

X_t = number of man-hours in time period t

B = backshift operator

n_t = random error term

The interpretation of the formula is as follows: The number of accidents occurring in time period t(Y_t) is affected in a negative way (reduction) by the number of visits by STEP in time period t-1 (note X_t-1) in the formula). Other terms affecting the forecast are accidents in time period t-1 and t-2 (note B and B^2 terms in the formula) plus a random error term n_t.

Figure 7 shows a 16 week forecast beginning at week 67 through week 83 using the above relationship. The accidents during weeks prior to week 67 and the visits were used to generate the forecast. The introduction of visits did in fact improve the accuracy of forecasted values since the sum of squares variation between actual and forecasted values was reduced by 35 percent over the case where man-hours were not used, but the dependence was not judged statistically significant.

6. Halo Effects

The relationship of accidents to enforcement was further narrowed to a time unit sensitive to hours and to an area unit sensitive to individual zones. The goal was to use computer plotting routines to examine accidents as a function of time since a STEP officer visited a STEP location and as a function of enlarging areas of possible STEP officer influence. To generate this function, a computerized history of each zone was made. The computerized history contained the time, to the hour, of each STEP officer's visit to the zone, and the time, to the hour, of each accident in the zone. From this, the time between officer visits and future accidents could be measured within a zone. Zones could also be cross-correlated, i.e., the time between an officer visit and future accidents in an adjoining or other "related" zone could be measured.

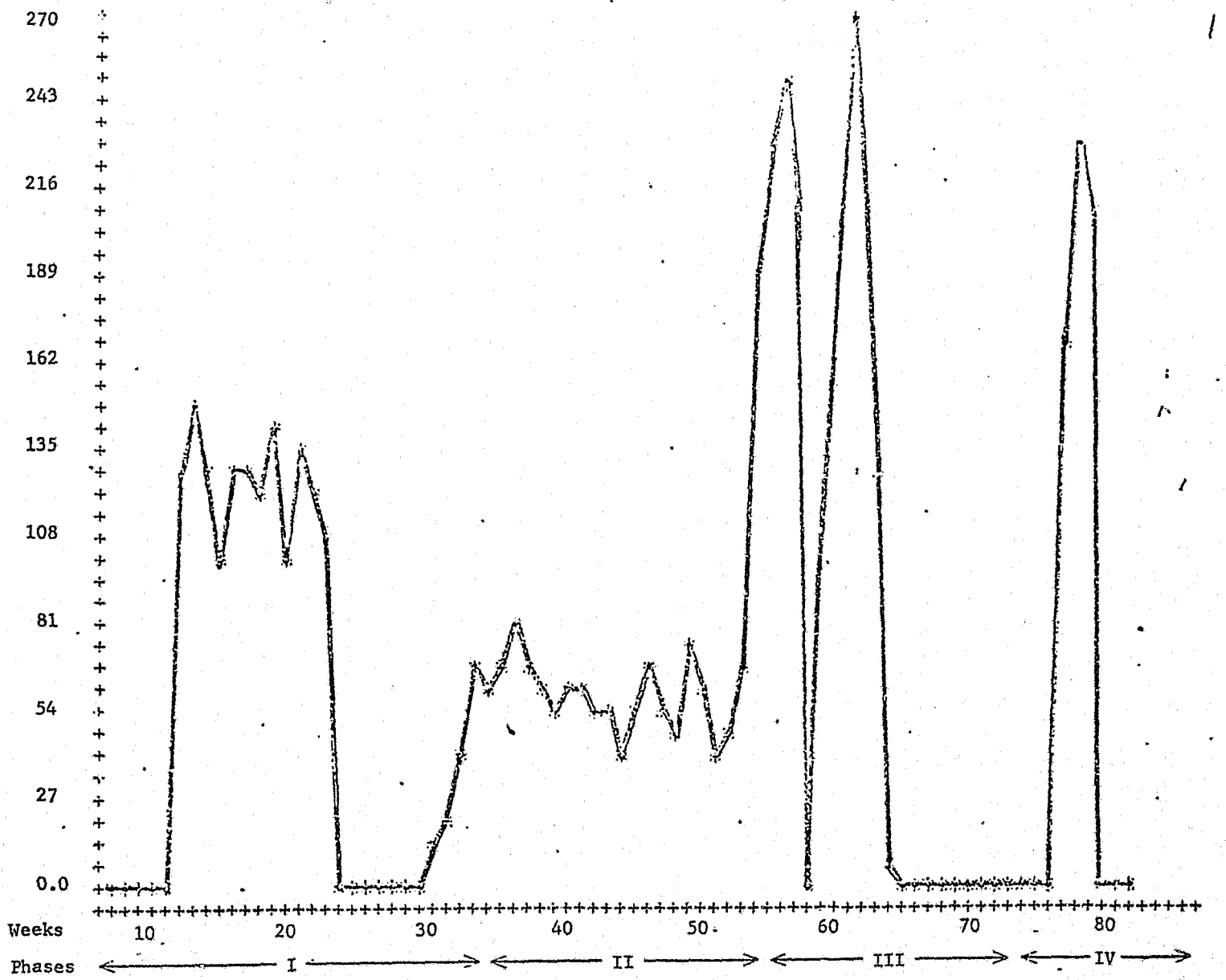


Figure 5. TIME SERIES FOR VISITS

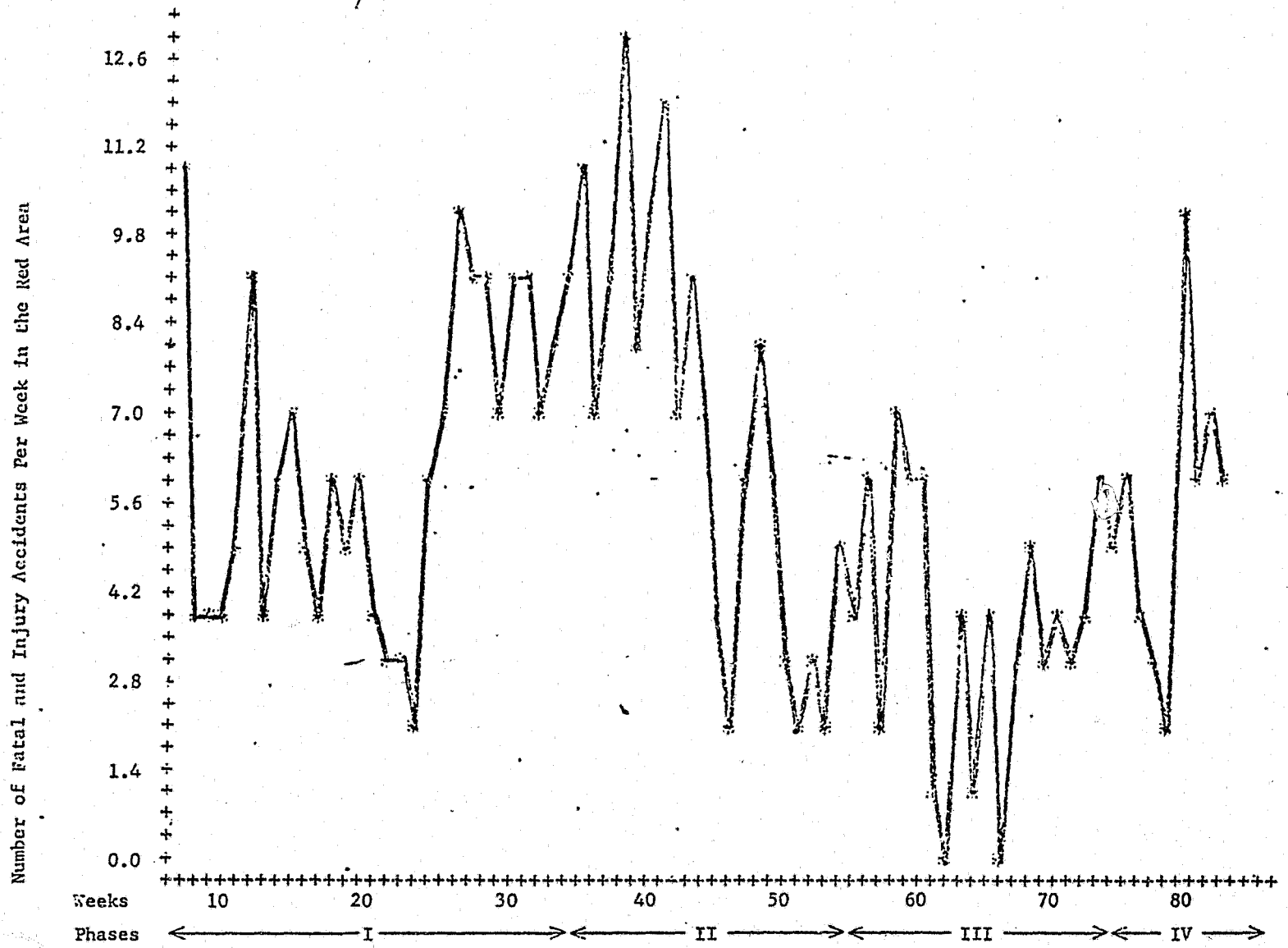


Figure 6. TIME SERIES FOR ACCIDENTS

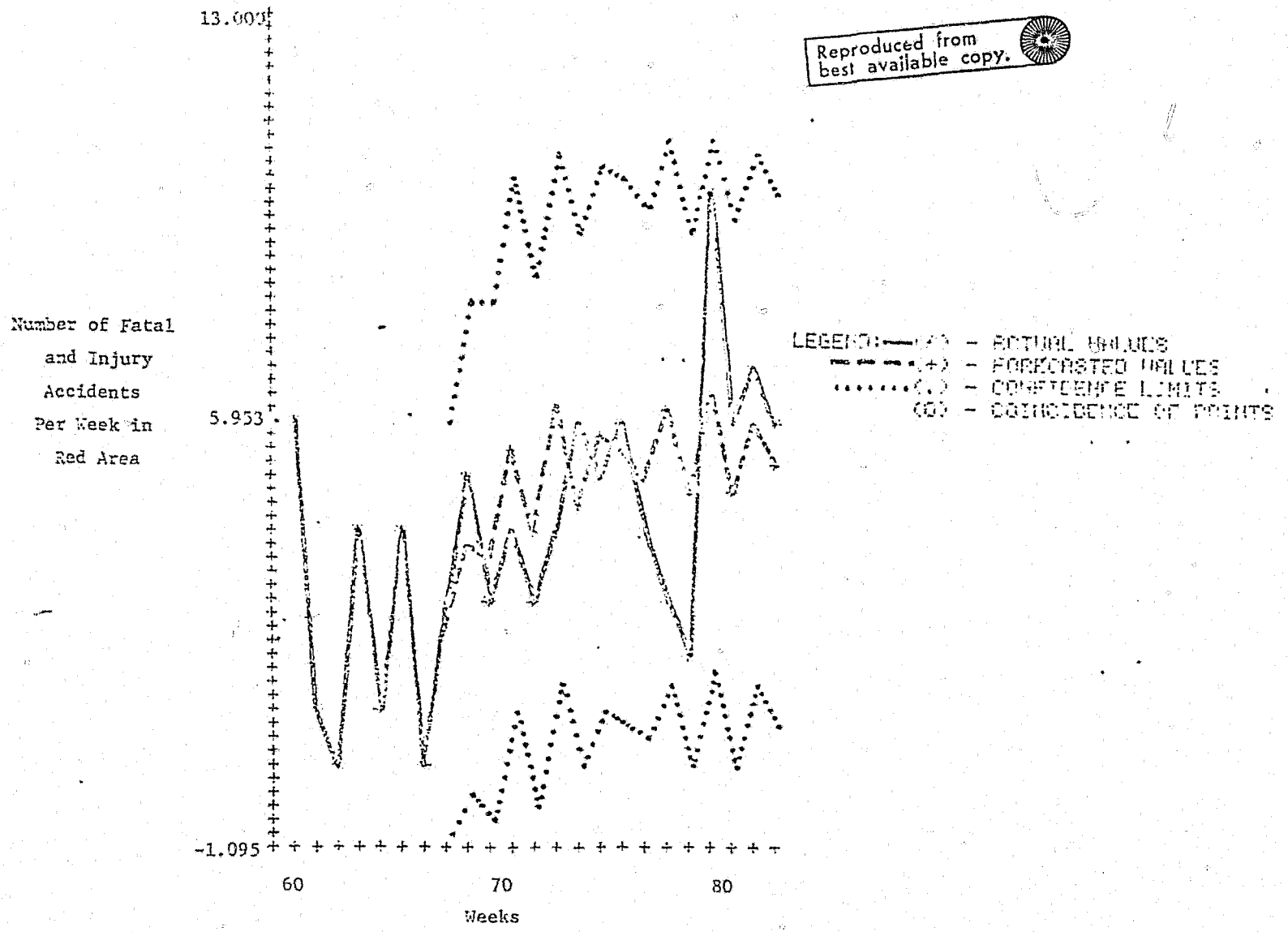


Figure 7. TACOMA TRAFFIC ACCIDENT FORECAST

For the analysis, several items of interest were generated from this computerized history. The time between every two successive accidents in a zone was checked, and if no officer visited the STEP zone (or a "related" zone) between accidents, that fact was recorded. If one or more officers did visit between accidents, the time of the last visit, the number of previous visits of interest, and zone "relationship" were recorded.

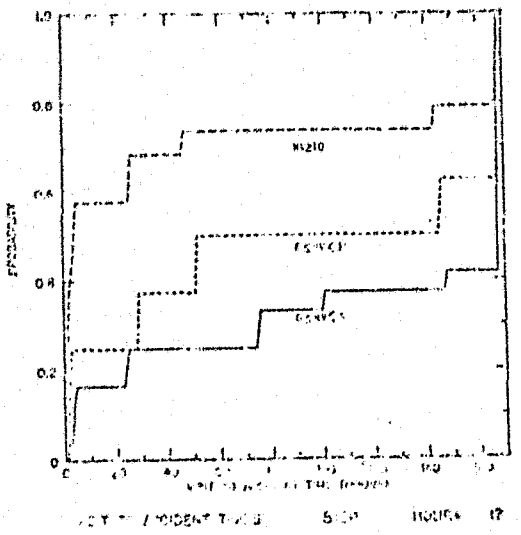
Using these items, the frequencies of the accidents as a function of officer visits were studied extensively for the STEP zones, and for non-STEP zones. For STEP zones, only effects within the same zone were considered. For non-STEP zones STEP officer visits were not in the same zone as the accident, but in the next. Multiple effects were considered for non-STEP zones--some zones adjoined two STEP zones and, in this case, effects of both STEP zones were summed.

Graphs were made for accidents occurring at each of the 24 hours of the day throughout the experimentation. Some example graphs are in Figure 8. These graphs use data from Experimental Phase III (one-half hour visits) and for accidents occurring between 1700 and 1800 hours. These graphs show the probability of having an accident (evidenced by the frequency in the data) as a function of the time since the last officer visited the type of zone being studied (STEP or non-STEP). For graphs A and B, the number of previous visits, NV, was considered as a parameterization. Zones which had been visited heavily during the week prior to the last officer visit were considered apart from those less frequently visited. For graphs C and D, the parameterizations were on the number of STEP locations, SL, within a STEP zone. Graphs A and C are for STEP zones and Graphs B and D are for non-STEP adjoining zones.

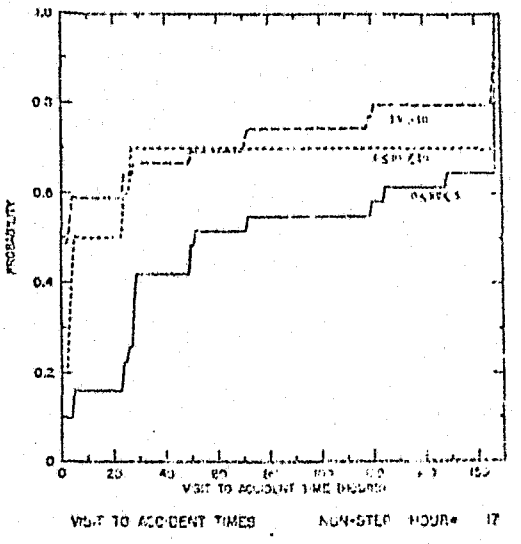
First, the graphs show officer scheduling--eight-hour jumps where STEP officers are on duty and then the 16 hours when STEP was not in operation. Graph A shows higher accident rates in STEP zones when more previous visits were made. Graph C shows that, to a certain extent, this can be explained by certain zones (those with two STEP locations) having more visits. The relative shapes of these curves are important. They do not support the hypothesis of low probability of accident for recent officer visits (time halo effect); they do not support the hypothesis that STEP zones are more sensitive than non-STEP zones (area halo effect).

The example graphs shown here are typical. It is possible that other effects are overpowering the measurements:

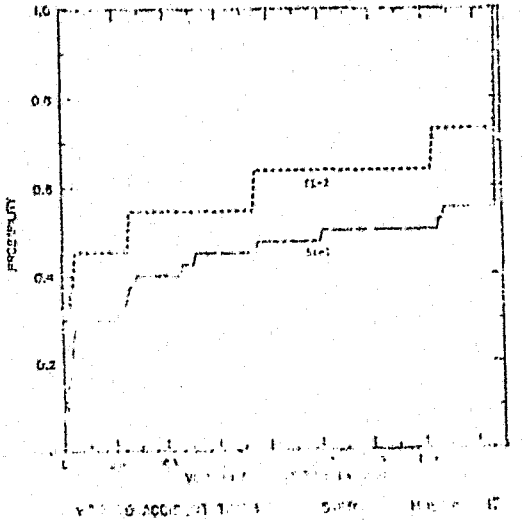
1. Officers were visiting STEP zones so frequently (4-8 assignments each day for each officer) that most STEP zones were visited within 24 hours in an experimental area.
2. In a control area, STEP zones were not visited for several weeks.
3. No visits were made in either area on the weekend.



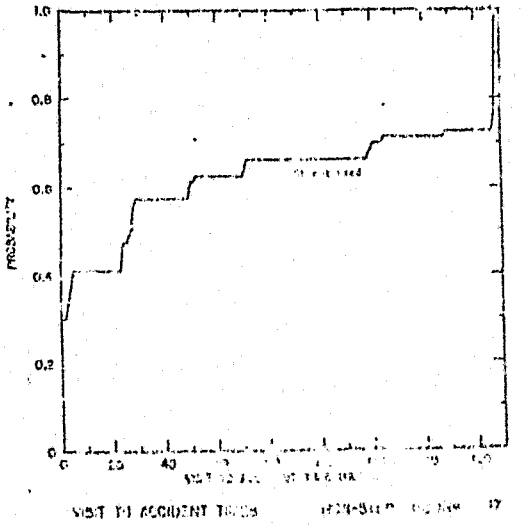
Graph A



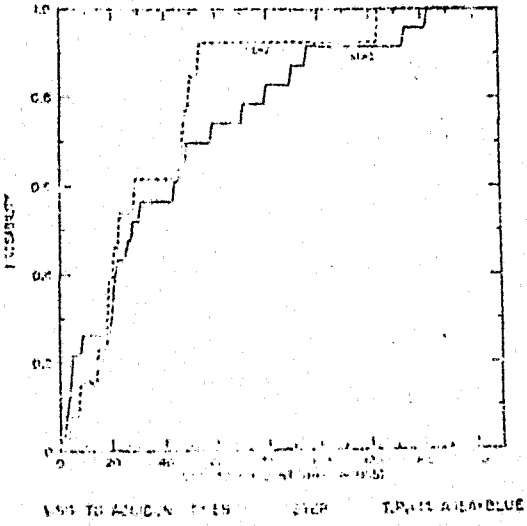
Graph B



Graph C



Graph D



Graph E

Figure 8. COMPUTER PLOTS OF TIME AND AREA

Additionally, these graphs may merely show officer schedules as evidenced by accident, i.e., the accidents are random. One time period was selected where officers had not been in the Blue area for 12 weeks prior to the six weeks analyzed, when the Blue area only was worked (one hour assignments). For this time period, all hours of the day were combined and Blue area STEP zones only were used in one of the graphing routines, shown as Graph E on Figure 8. During this time period, it can be estimated that about one officer out of ten would not be on duty in the field.

Using the schedule design, for 12 zones with one location and 4 with two in the Blue area, it was reasonable to cover a rough estimate of two-thirds of the zones each weekday. Then, taking the probability of an accident occurring within 24 hours of a weekday as five-sevenths, the probability of an officer being in a zone during the 24 hours prior to an accident was estimated as $p = 5/7 \cdot 2/3 = .48$.

When this point (24, .48) is plotted on Graph E and compared to the actual data, it becomes evident that the correspondence is very good. This procedure was continued and refined, but the correspondence was quite apparent. Therefore, these comparisons substantiate the conclusion that the graphing procedure was primarily a plot of the probability of officer visits or merely reflected the scheduling of officers, i.e., that no relationship of officer visits to accidents could be shown.

7. Accidents and Enforcement

Throughout the history of traffic enforcement, the generally accepted theory has been that enforcement was somehow tied directly to accidents--that increased or decreased enforcement brought about a corresponding decrease or increase in accidents. However, the Tacoma Police Department examined 15 years of accident statistics and saw a random pattern of accidents seemingly unrelated to enforcement. Occasionally a peak of enforcement effort might correspond to low accident level but equally often peak enforcement matched a high accident level. Previous enforcement projects, attempting to prove a relationship between enforcement and accidents, were often based on inaccurate measurements. Also, data which did not support the desired outcome were ignored, factors bearing on the results were overlooked, and experiments were of extremely short duration.

A guiding principal for the entire STEP project in Tacoma was that if complete control of all aspects of the experiment could not be assured, then the outcome or results would be suspect and the experimental idea would be abandoned. While this project's conclusions are not extensive, the Tacoma Police Department and the evaluator are confident that they were based on data which was accurately obtained and interpreted.

No significant reduction or increase in accidents was found either overall or at specific locations, which could be attributed to a specific enforcement action. This result, in the opinion of the Tacoma Police Department and the evaluator, does not imply that all traffic enforcement can be eliminated without affecting the accident picture. That particular experiment has yet to be conducted. It is implied, however, that enforcement needs to consider totally new approaches to the accident problem since neither the traditional nor the newer methods used for Tacoma STEP have been shown to have measurable effect at this time.

E. Recidivism Study

Project staff and police traffic administrators who learned about the Tacoma STEP showed concern about experimentation in the use of verbal contacts in lieu of citations: those who received verbal contacts might be relatively unaffected by the experience or even negatively affected and would thus continue committing violations. To examine future effects of the verbal contact, a one-year tracking of violation records involving nearly 900 drivers was undertaken. The purpose of this tracking was to determine the recidivism rates of drivers receiving verbal contacts as compared to drivers receiving citations.

1. Selection of Samples

A 19-week period from March 4, 1974 to July 31, 1974 was selected to obtain names of individuals contacted by STEP officers at STEP locations. Both verbal and citation contacts were included. During this time period, the penalty severity countermeasure (verbal versus citation) was varied weekly so that individuals having the same non-flagrant violations were cited or not, depending on the week.

Constraints for sample selection of individuals contacted during this time period are given below:

1. Contact did not involve a traffic accident
2. Contact did not result in court action
3. Individual contacted was a Tacoma resident
4. Individual had only one citation on the day his name was selected (if the individual had one citation and one verbal, the citation only was used)
5. Complete and consistent data on the contact were available
6. Contact was for specified types of violations.

The samples obtained are shown in Table 23 by type of violation and severity of penalty for initial contact, and by age and sex of the individual. The two samples resulted in a total of

Table 23. ORIGINAL STATUS OF INDIVIDUALS TRACKED

Type of Violation	Number and Percent* of Individuals Contacted					
	Verbal		Citation		Both Samples	
	Number	Percent	Number	Percent	Number	Percent
Failure to stop	325	(59)	159	(50)	484	(56)
Failure to yield right of way	82	(15)	41	(13)	123	(14)
Improper turn	81	(15)	31	(10)	112	(13)
Licensing violations	2	(<1)	75	(23)	77	(9)
Other	58	(11)	13	(4)	71	(8)
		(100)		(100)		(100)
Age						
35 or younger	304	(55)	207	(65)	511	(59)
Over 35	244	(45)	112	(35)	356	(41)
		(100)		(100)		(100)
Sex						
Male	378	(69)	226	(71)	604	(70)
Female	170	(31)	93	(29)	263	(30)
		(100)		(100)		(100)
Total						
	548		319		867	

* Percent figures in parentheses.

867 individuals; 548 verbal contacts and 319 citation contacts. There were a total of 604 males and 263 females in the samples. Females represented 30 percent of the total and roughly 30 percent of each sample, verbal and citation. The average age of all individuals was 36.3; 35.4 for males, 38.4 for females. The initial verbal contact group tended to be older than the citation group.

After the time of initial contact by a STEP officer the number of subsequent verbal contacts made by STEP officers and citations given by any officer were counted for one year. Although the time of initial contact ranged over a 19-week period, tracking time was exactly one year for each individual.

2. Recidivism Rates

For both samples combined, 732 of the 867 individuals never had another documented contact by any officer in Tacoma in the subsequent one year tracking. Individuals receiving from one to six citations numbered 115, and 31 received another verbal contact, no one had more than one subsequent STEP verbal contact. More specifically, 94 individuals had one subsequent contact; 27 had two; 11 had three; two had four and one had six.

For each group, those who were initially cited and those who were initially contacted verbally, the number of citations recorded in Tacoma during one year were counted. Table 24 shows the percentage distribution by the number of subsequent citations for both groups. For example, the table shows that of all violators initially contacted verbally, 87 percent received no citations during the following year. Of those cited, 86 percent received no citations during the following year.

Table 24. CITATION RECIDIVISM RATES

Number of Subsequent Citation Contacts	Original Penalty	
	Verbal (percent)	Citation (percent)
0	87	86
1	9	9
2	2	4
3	1	<1
4	<1	<1
5 or more	0	<1

$\chi^2 = 6.58737$
d.f. = 5
Conf. level = .7468

Tests for independence (χ^2) indicate no statistically significant differences between verbal and citation initial contacts. Percentage-wise, the initial verbal contact had slightly fewer individuals who recidivated.

Next, the subsequent verbal contacts made by STEP officers were considered (Table 25), and finally, both types of contacts were combined for a total recidivism rate (Table 26). As noted above, only 31 individuals in either sample received a subsequent verbal contact from a STEP officer and none received more than one. Thus, analyses of these data separately tend to be weak. Nevertheless, subsequent verbals are given below by initial contact status:

Table 25. VERBAL CONTACT RECIDIVISM RATES

Number of Subsequent STEP Verbal Contacts	Original Penalty	
	Verbal (percent)	Citation (percent)
0	96	97½
1	4	2½

χ^2 = 1.21481 (corrected)
d.f. = 1
Conf. level = .7296

This test also shows no statistically significant results, but the initial verbal contact group had more further verbal contacts.

Finally, the number of subsequent contacts recorded (any citation or a STEP verbal contact) were analyzed. (See Table 26) Again, no statistically significant results were obtained in the comparison of individuals initially contacted verbally versus citation.

Table 26. TOTAL RECIDIVISM RATES

Number of Subsequent Contacts (Citation or STEP Verbal)	Original Penalty	
	Verbal (percent)	Citation (percent)
0	85	84
1	11	11
2	3	4
3	1	1
4	<1	<1
5 or more	0	<1
Total	100	100

$\chi^2 = 3.00229$
d.f. = 5
Conf. level = .3004

Differences in recidivism rates by sex were noted for the two samples in Table 27. Females initially cited had more subsequent contacts than females initially contacted verbally. The referse was true for males:

Table 27. TOTAL RECIDIVISM RATES FOR MALES AND FEMALES

Males

Number of Subsequent Contacts (Citation or STEP Verbal)	Original Penalty	
	Verbal (percent)	Citation (percent)
0	81	83
1	13	10
2	4	4
3	2	1
4	<1	<1
5 or more	0	<1

$\chi^2 = 3.12113$
d.f. = 5
conf. level = .3187

Females

Number of Subsequent Contacts (Citation or STEP Verbal)	Original Penalty	
	Verbal (percent)	Citation (percent)
0	93	86
1	7	12
2	0	2
3	1	0

$\chi^2 = 6.58363$
d.f. = 3
conf. level = .9136

χ^2 tests for independence were made for the males and females separately. The test for females shows statistically significant differences at the .10 level for initial verbal contact versus initial citation contact; the test for males does not. Thus it can be considered that verbal contacts may have resulted in lower recidivism rates than citations, for females only. For males, the reverse is indicated, but results are not statistically significant.

Frequently observed differences in recidivism rates, male greater than female are again observed here. For both sexes, older drivers had fewer subsequent contacts, but no new results were obtained by testing age groups separately.

F. Public Information

As one facet of the Tacoma STEP, a public information campaign was extensively conducted. The importance of an informed public was a major concern of project staff and personnel. The objective was to educate and attempt to obtain voluntary compliance with the traffic laws. Every effort was expended to insure that the ultimate goal of an aware citizenry became a reality. Newspapers, radio and television were utilized. News releases, spots, interviews, and personal appearances were made, and newspersons were invited to observe all areas of STEP operation. In addition to media information, a concentrated effort was made to attend as many civic, business, or other group meetings in the Tacoma area as possible. Every high school in the city was continually visited and appearances at the court-assigned Defensive Driving School were made on a weekly basis. Groups visited were composed of as few as three and as many as three hundred persons, and presentations were made as early as 0600 hours and as late as 2200 hours.

All officers assigned to the STEP Project were in some way involved in the public information effort. Every contact with a violator was viewed as an opportunity to inform the individual of project objectives and to enlist his cooperation and assistance. Officers discussed the program with each violator and presented a pamphlet with each contact made, whether or not a citation was issued. In addition to this, a special course in public speaking was developed by the staff and each project officer who wished to become involved in the more formal aspects of making group presentations was required to attend. Presentations were made both on an over-time basis and during working hours. Taking an officer off the street to talk to a group of drivers was considered more beneficial, even during rush hour periods, than leaving him on the street where only one or two individuals might be contacted. Officers were encouraged to seek out groups in all areas and arrange talks on their own. In addition, speaking engagements were made on a rotating basis unless a specific individual was requested.

During the project over 400 formal presentations were made by project personnel to civic, business and other groups with a total listening audience of over 14,000 individuals of driving age. The primary purpose of these talks was to frankly explain the old ideas of enforcement and their seeming lack of relationship to traffic accidents, present the STEP philosophy of enforcement, and state the principal STEP objective--to scientifically compare the two approaches. (It was interesting to note that in all the talks given during the project, only one nonpolice individual expressed dissatisfaction with the STEP approach.) It was explained to drivers that they could help by realizing and accepting their responsibility for proper driving.

The talks ended with a question and answer session. This was probably the most beneficial part of the program as the speaking officer became aware that it was impossible to justify many of the traffic enforcement techniques being used outside of STEP. The officer could then admit that certain techniques were probably not proper and go on to show how STEP was attempting to change those practices. Although project personnel made numerous TV and radio appearances, several of 30 and 60-minute duration, and the newspapers cooperated by using STEP releases and doing feature articles about many aspects of the project, it was also felt that the opportunity to question officers directly at presentations was vital to the public's understanding and acceptance of the project.

The STEP project also made extensive use of handout brochures. In addition to those given to every individual contacted by a STEP officer in the field, special handouts were prepared for business and civic groups soliciting talks. Figures 9 and 10 show examples of handouts used in the Tacoma STEP project.

Evaluation of the effects of a public information campaign is a difficult task. Often effects are evaluated based on subscription figures or total potential listening audience, giving little attention to the number who actually read or heard the message. In order to evaluate the STEP public information effort, traffic violators contacted by STEP officers in the field were questioned. For every STEP contact made, the officer used a code on the citation or verbal warning form to indicate the violator's knowledge of the program prior to the contact. STEP officers questioned approximately 16 percent of the total drivers who committed violations in Tacoma during the operational period of the study. During Phase I, 27 percent of these violators had previous knowledge of the STEP project and its aims. This figure was increased to 33 percent during Phase II, 37 percent during Phase III, 39 percent during Phase IV and 35 percent in Phase V. While this method of evaluation does not measure the accuracy of violator's response, it does clearly refer to the public information campaign's target population.

Figure 9. PAMPHLET ACCOMPANYING INDIVIDUAL CONTACT

A STEP AHEAD

Ever since February 5, 1973, motorists in Tacoma have been involved in a special program of traffic law enforcement known as STEP. The Selective Traffic Enforcement Program is a three-year, federally-funded project which is being conducted by the Police Department's Traffic Division.

STEP is dedicated to determining the most efficient and effective means of preventing the violation-caused accident. Various methods of traffic enforcement will be demonstrated in the city during the coming months and each will be evaluated to determine effectiveness.

We realize STEP is not the total answer to the traffic accident problem, but we do believe it will help reduce accident frequency at dangerous locations. Some people think STEP is a massive ticket-writing campaign, but it isn't. Our officers employ several types of enforcement when making a contact. They may write a formal citation, issue a written warning or give a verbal warning depending on the severity of the violation.

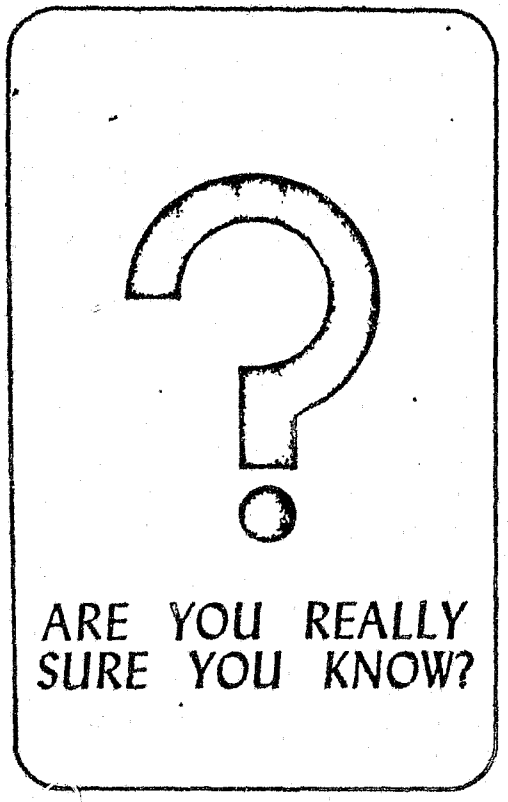
STEP is not directed at any particular group within the driving public . . . just the violator who has committed a hazardous violation. We realize the importance of preventing the accident from happening in the first place, therefore, we employ different methods of observing a hazardous location. For the most part, STEP vehicles are in highly visible locations where the public can easily see them. This helps prevent willful violations from happening. We would rather prevent a violation than investigate the accident that violation might create.

STEP is a project designed to help you drive the city streets in greater safety. We need your help, however, in the form of voluntary compliance to our traffic laws. The final answer to our accident problem rests with each motorist and his or her actions behind the wheel. Do your part in keeping Tacoma a safe place to drive . . . obey the laws and drive defensively.

If your group or organization would like to know more about STEP, call us at 593-4886 for a speaker. We want you involved as interested citizens, not casualties from an auto accident.

Chief of Police

Commander, Traffic Division



WHAT IS SELECTIVE TRAFFIC ENFORCEMENT?

MORE TICKETS?

MORE POLICE?

STRICTER ENFORCEMENT?

MORE RADAR PATROLS?

MORE CONCEALED CARS?

ADDITIONAL MOTORCYCLE PATROLS?

MORE TRAFFIC LAWS?

OR WHAT?

SELECTIVE TRAFFIC ENFORCEMENT PROGRAM
TACOMA POLICE DEPARTMENT

MANY PEOPLE THINK THEY KNOW, BUT...

Did you know that traffic enforcement has been practiced by the Tacoma Police Department since the first automobile came to the city early in this century? You would think that after more than 60 years of experience in the field, we would have learned just about all there was to know on the subject. However, did you know that a $695,000 grant to the Tacoma Police Department from the National Highway Traffic Safety Administration in 1972 has allowed us to take an in-depth look at traffic enforcement through a program called STEP? Did you also know that because of STEP, some old enforcement techniques will be laid to rest and some new ideas regarding methods and penalties will soon take their place?

These and many other areas concerning the meaning and use of selective traffic enforcement programming will be answered in depth by a member of Tacoma's STEP Project if you'll just take the time to call 593-4886 and request a speaker be reserved for your next group meeting.

Regardless of the size of your organization, we have a program designed especially for you. We want to take a few minutes of your meeting to explain how important your role is in our overall program and how you, as an individual motorist, can help make Tacoma a safer and more pleasant place in which to drive.

Give us a chance to help you and the members of your organization have a better driving record. Call 593-4886 and reserve a date and time now! We'll gladly answer any and all questions you or your friends may want to ask about old or new traffic enforcement.

Become an involved and concerned citizen today -- take "A STEP Ahead" and learn what selective traffic enforcement is really all about.

Lyle E. Smith
CHIEF OF POLICE

Bill McDonnell
STEP PROJECT DIRECTOR

Figure 10. BROCHURE PREPARED FOR ORGANIZATIONS

VI OFFICER IMAGE AND PUBLIC ATTITUDE

Current public interest in the operation and activities of governmental agencies makes it imperative that administrators closely examine their entire operation to insure that, not only are they performing a service, but additionally that the public can readily perceive this function. Publicity and the actual operations of the agency and individual members must be consistent if credibility with the public is to be maintained.

Through the years, a stereotype of the traffic enforcement officer has evolved--the stern-faced motorcycle officer hiding behind a sign-board or building, waiting for an unsuspecting motorist to commit an unintentional violation, then swooping down to add another ticket to his quota. While movies and television have played a small part in sustaining this image, the traffic enforcement operation in general and the enforcement officer in particular share a greater part of the responsibility.

Consistent with the above-mentioned enforcement image are actual traffic enforcement policies which are based on a consideration of city revenues gained from citations and which measure officer effectiveness according to the quota system. The image can only be changed by starting at the top and working down to the officer on the street. The police chief and the governmental officials to whom he reports must understand and be openly dedicated to an enforcement philosophy which encourages enforcement officers to avoid covert traffic observation and removes the pressure regarding quotas. This dedication and understanding must travel down the chain of command to the first line supervisor and, only then, can the officer on the street begin the long process of changing public attitude toward the enforcement function.

A. Tacoma STEP Officer Image

The actual methods of on-street image alteration used by Tacoma STEP officers, is given throughout this report and thus will not be repeated here; however it should be noted that during the two and one-half years of operation a gradual change was observed by the Tacoma Police Department in the public attitude toward STEP personnel. This change was not observed in non-STEP traffic enforcement units. The primary difference was attributed to the basic philosophy--preventive enforcement--and the training of officers in improved officer-violator relationship.

Changes in public attitude which were noted were, for example, fewer complaints about the officers, support of civic groups, and various comments made to STEP officers. After two years of operation,

the police department made an attitude survey of drivers in order to more objectively measure the difference between the public attitude toward STEP officers and other officers.

B. Public Attitude Questionnaire

All violators, excluding arrestees, who were contacted at a STEP location during STEP operation hours (1100-1800, Monday - Friday) from January 3, 1975 to January 27, 1975 were sent a STEP Evaluation questionnaire (see Figure 11). Those contacted had been issued verbal warnings or citations, if contacted by STEP officers, and citations only if contacted by other officers. Answers to the questionnaire coupled with the contact record provided information on the following:

- Violator's reaction to STEP officers versus other officers
- Violator's reaction to receiving a citation versus verbal warning
- Violator's opinion about traffic enforcement in general in Tacoma

1. Questionnaire Response

A total of 595 questionnaires were sent; 425 from STEP contacts and 170 non-STEP. Table 29 shows that the return rate for STEP contacts was 47 percent; and that only 17 percent of those violators contacted by non-STEP officers responded to the questionnaire.

Table 29. RETURN RATES FOR STEP AND NON-STEP OFFICERS

Questionnaire Response	Number	Percent		
		All Officers	STEP Officers	Non-STEP Officers
Responded	228	38	47	17
No Response	367	62	53	83
Total	595	100	100	100

Thus, overall, the STEP officer had a far greater percent response. This was true even of those violators receiving citations (33 percent response for STEP, 15 percent for non-STEP) and written warnings (43 percent response for STEP, 26 percent for non-STEP). In fact, the percent response increased with decreased penalty severity as shown

Please check the box which best applies.

A. Before I was stopped:

1 ☐ I had never heard about STEP
2 ☐ I already knew something about STEP

B. As I recall it, the officer who stopped me:

1 ☐ talked about the STEP program
2 ☐ did not talk about STEP

C. The officer who stopped me:

1 ☐ used his siren
2 ☐ did not use his siren

D. In my particular case, a siren:

1 ☐ should have been used
2 ☐ was not needed

E. The officer who stopped me was:

1 ☐ friendly and polite
2 ☐ just polite
3 ☐ not very polite
4 ☐ unnecessarily rude

F. The officer's attitude seemed like:

1 ☐ a sincere concern for my safety
2 ☐ a person just doing his job
3 ☐ a big shot treating me like dirt

G. The officer:

1 ☐ only gave me a good talking-to
2 ☐ let me go without saying much
3 ☐ gave me a ticket and talked a lot
4 ☐ just gave me a ticket without saying much

H. During the time I was stopped:

1 ☐ the officer did almost all of the talking
2 ☐ we talked back and forth
3 ☐ I did most of the talking

I. The officer who stopped me:

1 ☐ seemed interested in my opinion
2 ☐ would not listen to my side
3 ☐ did not act either way

J. The officer's appearance seemed to be:

1 ☐ unusually neat and well groomed
2 ☐ about average
3 ☐ a little sloppy
4 ☐ a disgrace

K. I feel that the police in this city stop people mostly:

1 ☐ because they broke a law
2 ☐ because they did something that could cause an accident
3 ☐ to get money for the city
4 ☐ to harrass certain people or groups

L. After being stopped, my feelings about traffic police have:

1 ☐ changed for the better
2 ☐ become less favorable
3 ☐ remained the same

M. I believe traffic enforcement in this city:

1 ☐ needs to be made stronger
2 ☐ is already too severe
3 ☐ is about right

N. When I was stopped by the officer, I received:

1 ☐ a ticket requiring a fine
2 ☐ a warning ticket but no fine
3 ☐ only a talking-to

O. In the future people doing what I was stopped for:

1 ☐ should not be stopped
2 ☐ should get less penalty than I did
3 ☐ should be treated about the same
4 ☐ should get a stronger penalty than I did
5 ☐ should be jailed

P. I think that:

1 ☐ we need more traffic police in Tacoma
2 ☐ we have too many traffic police in Tacoma
3 ☐ the number of traffic police in Tacoma is about right

Table 30. RETURN RATES BY PENALTY SEVERITY

Penalty Severity:	Percent Response	
	Responded	No Response
Citation	25	75
Written Warning	37	63
Verbal Warning	63	37

Table 31 shows the percent response by age and sex groups. An increase in age corresponded with an increase in percent response. The table also indicates that a greater percentage of females answered the questionnaire than males.

Table 31. RETURN RATES BY AGE AND SEX

Age:	Percent Response	
	Responded	No Response
Under 31	33	67
31-50	42	58
Over 50	55	45
Sex:		
Female	43	57
Male	36	64

2. Attitudes about Selective Enforcement

Those who responded generally reacted more favorably toward officers trained under STEP than non-STEP officers (see Table 32).

Table 32. STEP AND NON-STEP OFFICER RATINGS

Officer Rating	Percent Response	
Friendliness:	STEP Officer	Non-STEP Officer
Friendly and polite	78	59
Polite	15	29
Not very polite	3	4
Rude	1	4
Other/no answer	3	4
Total	100	100
Appearance:		
Neat	57	41
Average	37	48
Sloppy	2	7
Other/no answer	4	4
Total	100	100

STEP officers also showed a better exchange of conversation than non-STEP officers:

Table 33. EXCHANGE OF CONVERSATION

	Percent Response	
Exchange of Conversation:	STEP Officer	Non-STEP Officer
Both Talked	70	59
Only Officer Talked	23	37
Only Respondent Talked	2	4
Other/No Answer	5	0
Total	100	100

There was a greater tendency toward favorably changing the respondent's feelings about traffic police when contacted by STEP officers. But, as shown in Table 34, the contrast, citations to warnings is even greater.

Table 34. ALTERING FEELINGS ABOUT TRAFFIC POLICE
(Percent Response)

Feelings About Traffic Police	Officer		Action Taken by Officer		
	STEP	Non-STEP	Citation	Warning Citation	Verbal Warning
Change to better	36	26	17	46	45
Remain same	57	70	68	46	54
Less favorable	4	4	10	0	0
Other/no answer	3	0	5	8	1
Total	100	100	100	100	100

3. Effects of Penalty Severity

Generally, STEP officers made better impressions on respondents than did non-STEP officers. The number of favorable responses to questions E, F, I, and J (see Figure 11, p. 71) were compared for STEP and other officers (see Table 35). STEP officers received more favorable answers than did non-STEP officers: 52 percent of the respondents answered all four questions in the most favorable category for STEP officers, compared to 29 percent for other officers. However, when only citations are compared, STEP to other officers, the difference is less: 29 percent for STEP, 27 percent for non-STEP. In conclusion, non-STEP officers, even for violator attitude was considerably more favorable when verbal contacts were made.

Table 35. INFLUENCE OF PENALTY SEVERITY ON VIOLATORS' IMPRESSIONS OF OFFICER

Violators' Impressions of Officer	Action Taken by Officer						
	STEP Officer				Non-STEP Officer		
	Citation	Warning Citation	Verbal Citation	Total	Citation	Warning Citation	Total
Favorable (4)	29%	50%	65%	52%	27%	34%	29%
(3)	19	28	27	25%	50	33	0
(2)	35	11	6	16	14	0	11
(1)	12	6	2	5	5	33	11
Unfavorable (0)	5	5	0	2	4	0	3
Total	100%	100%	100%	100%	100%	100%	100%

VII STEP PERSONNEL WORKSHOP

As the evaluation of Tacoma STEP field operations approached conclusion, it became apparent that the officers who had actually been involved in the on-street portion of the project had a wealth of information that needed a vehicle for expression. After much discussion it was determined that a workshop, conducted in a structured but informal manner, away from the police department, would have the greatest chance for success. Such a workshop was held on June 25-27, 1975.

Following are the questions discussed and the general response which was elicited from the group.

1. What should be the function of radar in traffic enforcement operations and how and where can radar best be used consistent with the STEP philosophy of enforcement?

It was the general opinion that radar definitely had a place in the traffic enforcement operation, but that it has been misused in the past. Radar should be used as a tool in conjunction with other enforcement operations, at or approaching high-accident locations, or, for checking on specific complaints of speeding. In areas which invite speeding there should be a heavy emphasis on verbal contact and high visibility.

Under no circumstances should an officer be sent out to "work" radar for an entire shift. Officers who have radar sets in their vehicles must be constantly reevaluated by their supervisors to insure that they are not becoming merely robot ticket-writers as has happened in the past. Further, wherever radar is worked, it should be highly visible to the traffic it is monitoring and not hidden by parked cars or placed on a side street next to an arterial possibly blocking the view of a stop sign.

It is interesting to note that despite the fact that STEP had seven radar units in use, no complaints were made regarding use of radar. However, at public speaking engagements given by police officers, one of the most frequent complaints concerned the misuse of radar by other non-STEP agencies. Officers should be encouraged to explain and demonstrate the use of radar to the public.

2. Are there situations which justify the use of low visibility enforcement operations?

The use of low-visibility traffic enforcement was discussed and it was felt that if a particular problem or location did not respond to a concerted effort using high visibility, then low visibility could

be used. It was stressed that this reversal should be accompanied by extensive publicity explaining the reasons for the policy change and should be effected with particular emphasis on verbal contact.

If it is impossible to work a high-accident location in a highly visible manner because of the physical surroundings or parking restrictions, then either moving patrol should be used or, if a stationary assignment is necessary, it should be as visible as the particular location will allow. In no case should there be an actual attempt to hide. It was stressed that the manner in which the officer handles the violator contact often determines future driver attitude and is therefore very important.

3. Were any stress symptoms (boredom, anxiety, frustration, hostility, etc.) experienced as a result (or possible result) of any part of the STEP operation?

In general, the discussion indicated that the stress involved in STEP was not considered to be a major problem to the officers. However, some stress factors were noted.

One stress-causing aspect of the operation which was cited several times was the program's emphasis on maintaining a friendly approach, regardless of the provocation on the part of the violator. The officers found it extremely difficult to maintain this attitude when dealing with excessively argumentative or hostile violators, or to walk away from an argument without having the "last word" or without being able to convince the violator that he was at fault. Officers felt that if they had not been in STEP, they could have alleviated the rising tension by jailing the offender or by using physical means to subdue him. It was mentioned in the discussion that even those STEP officers who did not appear to be having any problems might, in fact, be taking their frustrations home with them.

Intersection assignments, particularly before they were changed from one hour each to one-half hour, caused some problems. Periods of inactivity led to prolonged introspection and/or daydreaming, sometimes to the officer's detriment.

It was generally felt that it took an extremely self-disciplined person to handle the regimentation and close supervision demanded in STEP. It was agreed that the first step in handling stress is to recognize those situations which produce frustration and provide a constructive outlet. It was felt that police departments the size of Tacoma's needed a trained psychologist on a full-time basis so that officers would get used to talking with him without feeling there was a stigma attached as is often the case now. It was also felt that many situations should provide for automatic contact with the psychologist--following a resisting arrest case for instance. Further, when an officer was involved in a highly stressful situation such as

a shooting, he should be required to take some time off without penalty where, with the aid of the psychologist, he could regain his perspective.

4. Did the comparatively close supervision in STEP create any problems and was it felt that supervisors were overly directive or authorative?

In general, the close supervision in STEP did not create problems for the officers. Because a relatively small number of men were being supervised by one sergeant, the officers felt that sergeants sometimes observed the men more closely than was really necessary. It was pointed out that as the span of control of the first line supervisor became smaller, more emphasis should be placed on his ability to relate effectively to those in his charge rather than on dictating every move the officer is to make.

5. What criteria should be used by supervisors and administration to evaluate the effectiveness or work performance of a traffic officer?

In evaluating traffic officers, the officer's entire performance must be examined, including the number of contacts he has made; but most importantly, it must be ascertained whether the citizens he has contacted are satisfied with his service. In addition, the officer's suitability to his job must be considered--he might be happier in another capacity. Whether or not the officer is satisfied with his own performance should be determined. Finally, the supervisor should be available when needed.

6. Are the high-accident locations also the high-violation or high-action locations? What factors should be considered when selecting a location for stationary assignments? What factors should be considered when removing a location from stationary assignment?

It was determined that the high-accident locations were not always the high-violation locations. Often such locations were active only during specific time periods on certain days. Some were problem locations only during certain seasons. Frequently, engineering problems were the source of accidents at a location and in this circumstance, enforcement effort, regardless of type, would have little if any impact. Therefore, before designating a location for stationary assignment, it should be determined whether or not it is a high-violation location. Despite these facts, high-accident locations should have first priority for an officer's traffic enforcement time. He must be made aware of all the problem areas in his district and be allowed to select the most active one at the time. It was considered counterproductive to send a man out to "work radar" or "work traffic" with no direction other than write tickets and with little supervision other than to count the tickets.

CONTINUED

1 OF 2

A general complaint of STEP officers was that once a location was put on the assignment list it practically never came off. Therefore, officers should provide supervisors with information about any changes that occur at the location which should be considered in keeping a location for assignment. Finally, officers felt that a more rapid indication that a particular location has "ceased" to be high-accident and information indicating that accidents have "moved" to a nearby intersection is needed.

7. How did officers measure any success the STEP project may have attained and did they think it had been succesful?

All the officers judged STEP's success in terms of whether or not the project had a positive effect on both the officers and the public they contacted, rather than on the number of tickets written or the number of accidents prevented. It was generally agreed that the public had begun to regard the officer as an individual rather than as a badge, that the number of violators who thanked the officer for the contact was significant, and that the officers themselves had experienced a change in attitude toward the public and the role of police in society. Further, they agreed that the STEP approach would eventually result in fewer accidents, though this might not be evidenced immediately. Further it had been demonstrated that this approach had no negative impact on the accident picture as was expected in some police and Federal circles.

8. Should officers be involved in all aspects of the public relations effort?

It was generally felt that all officers in the Traffic Division should be encouraged to participate in public information presentations at whatever level their competence would allow. If communicating to effect attitude change in drivers was to be the goal of traffic enforcement, then public speaking was judged a natural extension of the officer-violator contact effort. Such an opportunity also encouraged the officer to reevaluate his own enforcement outlook and actions.

9. How important is public relations to effective traffic enforcement operations?

If it has been determined that a particular enforcement program is a superior one, every effort should be made to promote the program in order to gain public support. If it should be necessary to maintain a low profile, it is nevertheless appropriate to let the public know where and why--it is not often necessary to operate in total secrecy. However, officers felt that the actions of officers on the street influence public opinion more than public information campaigns via the media.

10. What was felt to be the advantages and disadvantages of the verbal contact?

There was concern that if verbal contact was used in all instances of a particular violation regardless of the circumstances, then it might lose its effectiveness. Its advantages were that the officer was given an additional method of enforcement contact, free of the quota or money stigma, which he could utilize and yet be accounted for. Officers felt that using the verbal contact allowed them to be more selective in the citations they issued. This in turn made the citations which were issued easier to justify to the violator. The verbal contact allowed the officer an opportunity to favorably change the enforcement image.

11. Should verbal contacts continue to be documented as was done in STEP?

It was the emphatic consensus that verbal contacts must be documented to be effective. Further, only actual violators should be stopped, even for verbal contacts; using the verbal contact for 'near' violations or for extremely minor infractions can create as much public antagonism as issuing citations in those situations.

12. How long was it felt that a department could continue using verbal contacts before effectiveness was lost?

In the STEP staff's opinion, no time limit should be set on the use of verbal contacts. If used properly, they should continue to be effective indefinitely.

13. Should the individual or the violation be the deciding factor in determining whether or not a verbal warning is given, and should traffic record checks be made prior to giving a verbal warning?

It was felt that the particular circumstances of the violation should be the predominant determining factor for the use of verbal contacts and that the personality of the driver or his past driving record should play an extremely minor role. In fact, officers felt that except for license violations, a violator's record should not be obtained prior to issuing any enforcement action whether that action was a verbal or citation contact. The officer in the street should be the only authority for setting the initial penalty for a particular violation and the Violations Bureau should not be allowed to increase that penalty.

14. Do you feel that giving pamphlets to drivers, as was done in the early stages of STEP, was valuable and if so, what kind of information should they contain?

The officers felt that the Traffic Division should design a pamphlet which imparted clear, concise information to be given to

violators stopped by the police. The pamphlet should contain information to enlighten the driver as to the real reasons for traffic enforcement other than just giving a ticket. Pamphlets may answer questions which may later occur to the violator or which the violator was hesitant to ask.

15. Which aspects of the STEP operation would you like to see incorporated into the traffic enforcement operation, and what kind of training should be given to other officers to acquaint them with STEP philosophies and methods of violator contact?

There was a consensus that the entire STEP philosophy toward traffic enforcement, including use of verbal contacts, primary reliance on high-profile operations, and the friendly adult-to-adult approach to the violator should become a regular portion of the Traffic Division operation. They felt that non-STEP traffic officers should receive special training in officer-violator relations and public speaking and that STEP and Traffic personnel should get together to discuss STEP philosophies and methods in order to create an understanding and acceptance of their use by all.

16. How do you personally measure the effectiveness of a violator contact?

The officers measured the effectiveness of a violator contact by the feedback they got directly from the violator, and by discussing letters, questionnaires and complaints from the public to ascertain where individual improvement was needed.

17. How would you schedule officers for STEP?

While the scheduling used was acceptable during the project, it was generally felt that actual working schedules should be flexible enough to allow the officer the opportunity to do more overall police work. The schedules in STEP provided for officers to respond to certain types of priority and emergency calls; however, future traffic operations should provide for more varied police work on a regular, day-to-day basis. It was felt that this variety could be achieved consistent with officers maintaining a Traffic Division identity.

It was felt that no officer should be assigned to a particular location for more than thirty minutes at a time and that not more than three hours per day should be programmed. Further, lunch should not be prescheduled, but should be taked during "slack" periods.

The hours between 1100 and 1500 were found by officers to be extremely slow at the high-accident locations. This time could better be used doing nonenforcement related follow-up work on hit and run accidents or handling complaints of abandoned autos.

The discussion also dealt with the positive effect the preventive enforcement approach had on the officers themselves and their entire outlook toward their job as police officers. A statement made by one of the officers who was involved in STEP from the beginning, summarized the sentiment of the group:

> Before, when I wrote a ticket, I never related it to my own habits. Since I've been in STEP, I've been able to realize that your average traffic violator is really just the average person. You look at some of the violations you've written in the past and you really get the feeling of being a bigot. You stop someone for ten or eleven over and give him a ticket and then think about that morning being a little late and doing twelve or fourteen over the limit. You can't just jump out of the car and start leaning on these people; talk to them and listen to them, because it could be you sitting there. It's easier to deal with them on that level.

VIII INDEX TO THE REPORT: SUGGESTIONS FOR IMPLEMENTATION OF TRAFFIC OPERATION CHANGES

Often research projects such as the Tacoma STEP are conducted, and valuable information learned, only to find at their conclusion that the information either never reaches the people who can effect a change in enforcement procedures or is presented in such technical jargon that it becomes impossible to apply it to real-world operations. The purpose of this section is to provide the police administrator with a listing and brief synopsis of those sections of this report which contain information necessary to the implementation of the methods and philosophies judged effective during this project.

- The Tacoma STEP Philosophy. This section contains information which is basic to any attempt to successfully implement STEP methods into the regular traffic function. It provides an analysis of traditional traffic enforcement and offers some speculation as to the evolution of those traditions. It examines the characteristics of the people which must be affected if enforcement is to impact accidents, the objectives towards which enforcement should be directed, the methods which are available for use and the alternate penalties which can be applied. (See Section II-C.)

- Officer Scheduling. The criteria for selecting and removing high-accident locations from scheduling lists are discussed. The minimum and maximum amount of time an officer should be assigned to a specific location for selective enforcement purposes and the method of selecting these locations are also addressed. (See Section IV-A; also See Section VII-Question 6, 17.)

- Enforcement Policy. This section provides a suggested listing of violations which should be mandatory citation or arrest under all circumstances, a list of violations which should in most instances be verbal warnings and a third list of violations which, depending on the circumstances surrounding the violation, could be either citation, written warning or verbal contact. (See Section IV-D.)

- Officer-Violator Contact Training. This section details the training necessary to make the enforcement officer aware of the manner in which his actions affect a traffic violator. It suggests a style of approach which is designed to further the ideal of more positive violator contacts in order to effect lasting change in driver behavior. (See Section IV-B.)

- Officer Evaluations. The importance of basing an evaluation of traffic enforcement officers upon entire performance rather than on the number of citations produced is stressed. The evaluation places special emphasis on making follow-up calls on violators and other citizens served by the officer as an integral part of the evaluation process. (See Section IV-C; also See Section VI-A, and Section VII, Question 5.)

- Public Information. This section provides suggestions for an effective public information effort and stresses the importance of involving the enforcement officer in all aspects of the effort from individual violator contacts to formal public presentations and media appearances. (See Section V-F.)

- Officer Image and Public Attitude. This section looks at the current enforcement officer image and offers suggestions for effecting a meaningful change for the better. This section also details the use of a questionnaire in order to obtain public attitude information and points out specific areas needing further improvement. (See Section VI.)

- Conclusions and Recommendations. This section details, on a point-by-point basis, the advantages a police administrator can expect to gain by adopting the philosophies and methods detailed in this report. Benefits and costs are compared. (Section IX)

IX CONCLUSIONS

For the techniques studied, traffic enforcement could not be shown to effect a measurable sustaining positive or negative impact on overall accident experience in the city of Tacoma. There were benefits of the program in public attitude, officer improvement and careful documentation of experimentation in traffic enforcement methods.

Specifically, Tacoma STEP research conclusions were as follows:

- There were no localized accident reduction halo effects in time (since officer presence) or distance (to nearest officer) shown. No area-wide accident reduction effects were shown due to area saturation, high visibility or verbal contact policy. Citywide accident effects attributable to STEP were not shown.

- Despite the fact that there were no significant long-range differences in accident experience at locations using highly visible as opposed to inconspicuous traffic officer assignments, the officers felt much better about their enforcement activities when they were not required to hide in order to be effective.

- There were no statistically significant differences shown in the recidivism rates of traffic violators penalized by receiving citations as compared to traffic violators receiving verbal contacts for similar violations.

- It was the opinion of those involved in the project that on-street personnel should be involved in all aspects of the public information effort of the traffic agency, including public speaking to organized civic, business, and school groups, even if such participation removed the officer from the street during the peak traffic periods.

- Traffic violator attitudes toward individual officers and traffic enforcement in general were more favorable following a contact with a STEP officer than with a regular traffic officer; violators who had been contacted verbally (STEP only) had a considerably more favorable attitude than when citations were issued (STEP or other officers).

- A distinct advantage of utilizing the documented verbal contact was that by removing the pressure for citations, officers could more easily justify in their own minds the citations they did issue, thus making the task of justifying the citation to the violator much easier.

- While a tightly controlled scheduling of an officer's time is somewhat desirable from a supervisory standpoint, the problems of morale due to boredom tend to offset any gains. It was the officers' opinion that no more than three hours per day should be scheduled for stationary preventive enforcement, and that no more than 2 one-half hour consecutive assignments should be given. The remainder of his time should be more loosely structured, emphasizing preventive enforcement at high-accident locations but also allowing active involvement in other police functions such as follow-up investigations or handling nontraffic, crime related problems.

X RECOMMENDATIONS

Since the long-range accident reduction ability of preventive enforcement as studied in Tacoma was not shown to be statistically conclusive, it is necessary to look at the advantages and disadvantages of this method as compared to traditional enforcement. During the STEP research project, as the move was made from traditional toward preventative enforcement, the emphasis moved from monetary and citation volume considerations to enforcement activities oriented toward public cooperation and goodwill.

The philosophy of enforcement developed during the Tacoma STEP project, i.e., improved officer-violator relationship, use of verbal contacts and a greatly expanded public information effort, have proved to have no negative impact on the accident incidence in Tacoma. Also, the implementation of these methods into an operating police traffic enforcement unit can be accomplished without additional expenditure to the agency. Thus, the only loss from adopting this method is a loss of revenue from what could be considered excess citations.

The benefits a police administrator can hope to gain from this implementation fall generally into the category of improved public support for and understanding of both the enforcement operation and the individual traffic officer. Hopefully this improved public support will eventually reflect itself in the form of increased voluntary compliance to traffic laws and thus lead to a decrease in traffic collisions. Therefore, considering these positive effects, the Tacoma STEP philosophy can be considered a viable alternative to traditional enforcement methods.

BEST SELLERS

FROM NATIONAL TECHNICAL INFORMATION SERVICE

NTIS

An Inexpensive Economical Solar Heating System for Homes
N76-27671/ PAT 59 p. PC $4.50/MF $3.00

Medical Subject Headings, Annotated Alphabetic List, 1977
PB-255 932/ PAT 671 p. PC $16.25/MF $3.00

Permuted Medical Subject Headings, 1977
PB-259 021/ PAT 300 p. PC $9.25/MF $3.00

Nuclear Power Plant Design Analysis
TID-26241/ PAT 497 p. PC $10.60/MF $3.00

Medical Subject Headings, Tree Structures, 1977
PB-255 933/ PAT 464 p. PC $12.00/MF $3.00

Federal Information Processing Standards Register: Guidelines For Documentation of Computer Programs and Automated Data Systems. Category: Software. Subcategory: Documentation.
FIP SPUB 38/ PAT 55p. PC $4.50/MF $3.00

Solar Heating of Buildings and Domestic Hot Water
ADA-021 862/ PAT 90 p. PC $5.00/MF $3.00

Energy Efficiency and Electric Motors
PB-259 129/ PAT 188 p. PC $7.50/MF $3.00

Research and Technology Objectives and Plans
N77-12925/ PAT 199 p PC $7.50/MF $3.00

OSHA Safety and Health Training Guidelines for General Industry. Volume I.
PB-239 310/ PAT 117 p. PC $5.50/MF $3.00

Handbook on Aerosols
TID-26608/ PAT 149 p. PC $6.00/MF $3.00

Medical Subject Headings: Tree Annotations 1977. MEDLARS Indexing Instructions
PB-257 939/ PAT 118 p. PC $5.50/MF $3.00

Mineral Cycling in Southeastern Ecosystems. Proceedings of a Symposium Held at Augusta, Georgia May 1-3, 1974.
CONF-740 513/PAT 920 p. PC $23.75/MF $3.00

Natural Gas from Unconventional Geologic Sources
FE-227 1-1/ PAT 249 p. PC $8.00/MF $3.00

Vascular Plants of the Nevada Test Site and Central-Southern Nevada
TID-268 81/ PAT 315 p. PC $9.75/MF$3.00

HOW TO ORDER

When you indicate the method of payment, please note if a purchase order is not accompanied by payment, you will be billed an additional $5.00 *ship and bill* charge. And please include the card expiration date when using American Express.

Normal delivery time takes three to five weeks. It is vital that you order by number or your order will be manually filled, insuring a delay. You can opt for *airmail delivery* for $2.00 North American continent; $3.00 outside North American continent charge per item. Just check the *Airmail Service* box. If you're really pressed for time, call the NTIS Rush Handling Service (703)557-4700. For a $10.00 charge per item, your order will be airmailed within 48 hours. Or, you can pick up your order in the Washington Information Center & Bookstore or at our Springfield Operations Center within 24 hours for a $6.00 per item charge.

You may also place your order by telephone or if you have an NTIS Deposit Account or an American Express card order through TELEX. The order desk number is (703) 557-4650 and the TELEX number is 89-9405.

Thank you for your interest in NTIS. We appreciate your order.

METHOD OF PAYMENT

- ☐ Charge my NTIS deposit account no. _____
- ☐ Purchase order no. _____
- ☐ Check enclosed for $_____
- ☐ Bill me. Add $5.00 per order and sign below. (Not available outside North American continent.)
- ☐ Charge to my American Express Card account number

Card expiration date_____

Signature _____

☐ Airmail Services requested

NAME_____

ADDRESS_____

CITY, STATE, ZIP_____

Item Number	Quantity		Unit Price*	Total Price
	Paper Copy (PC)	Microfiche (MF)		

All prices subject to change. The prices above are accurate as of 5/77

Foreign Prices on Request.

Sub Total	
Additional Charge	
Enter Grand Total	

Clip and mail to

NTIS

National Technical Information Service
U.S. DEPARTMENT OF COMMERCE
Springfield, Va. 22161
(703) 557-4650 TELEX 89-9405

END