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[...] DOCUMENTATION

[...]OMIC ANALYSIS OF ROADWAY OCCUPANCY FOR FREEWAY PAVEMENT MAINTENANCE AND REHABILITATION

Prepared for
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16. Abstract A computer program developed to perform an Economic Analysis of Roadway Occupancy for Maintenance and Rehabilitation "EAROMAR" is documented. Input includes pavement design, thickness, lanes, project length, initial and final year traffic. The program generates hourly traffic volume by trip purpose, direction and year; vehicle operational cost as a function of vehicle weight, speed and project design alignment; value of time by trip purpose, income level and time loss, annual workload by activities; activity production rates and labor, equipment and material requirements. The information used in a roadway maintenance occupancy simulation subject to constraints on work crews and roadway occupancy. The influence of roadway occupancy on motorist is executed hourly for each activity and lane closure. The resulting operational, time, accident and pollution impacts are combined for all feasible closures including traffic detours and crossovers and output in a series of optional reports.

The volume is the third of a three volume report. The others in the series are:

Vol. No.	FHWA No.	Short Title
1	76-14	Final Report
2	76-15	User Manual

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PREFACE

Report Contents

"An Economic Analysis of Roadway Occupancy for Freeway Pavement Maintenance and Rehabilitation" is contained in three volumes. This is the result of work accomplished under a Federally Coordinated Research Program, Project 5E, Premium Pavements for "Zero Maintenance," during the period of July 1973 to May 1975.

Volume I, Final Report, provides a complete description of the scope, approach, and results of evaluating the economic impact of roadway maintenance crew occupancy, taking into account motor vehicle operating cost, value of time, accidents, and pollution under various freeway traffic conditions. The assessments and conclusions are based upon previous state-of-the-art and study of field data.

Volume II, Users Manual, presents the results of the study as a users manual with a systems approach to pavement design, which evaluates environmental, operational performance and serviceability factors for alternative pavements under a variety of rehabilitation and maintenance strategies. The presentation is in two parts: The first is the Algebraic Users Manual, for hand computations. The second is the User Manual for Program EAROMAR (Economic Analysis for Roadway Occupancy for Maintenance and Rehabilitation) which gives a detailed description of the format and coding for all required input and a general description of the optional input to modify the impacts for local needs.

Volume III, Program Documentation, contains a complete description of the internal variable and computations for the computer program EAROMAR, and thus is the basis for any future program modifications. The format and coding for all inputs are described in detail. One change to the program has been made by FHWA, which is documented in this Volume. This modification incorporates an inflation rate of 10 percent in present worth computations.

Report Applications

High traffic volumes, heavy loads, and weathering on existing pavement designs cause accelerated damage and early deterioration. Maintenance operations required to keep these highway facilities serviceable create a conflict with the motorist causing delays, and increasing pollution and accident opportunities. These repairs are: (1) costly due to the extensive traffic control required, (2) limited to between peak hour periods to avoid exceeding the traffic volume capacity, and (3) difficult to perform and often temporary due to problems in mobilizing the work crew. Thus the elimination of these impacts results in reduced highway maintenance expenditures and higher levels of safety, economy and convenience to the user.

The FHWA has determined that one solution to the difficulties associated with highway maintenance operations is to produce a "premium pavement" which reduces maintenance requirements. The savings derived from direct maintenance expenditures and motorist costs over the life of the pavement could be invested in constructing a "premium pavement" as compared to existing designs.

FOREWARD

The only change to the original EAROMAR program to date (as it appears in Appendixes A and B) is a FHWA Modification to incorporate an inflation rate in present worth computations.

1. A new internal variable RATEC has been added. This variable is the inflation rate in percent used in present worth computation. This variable should appear in the NAME DICTIONARY on page 27, and in Table 4 on page 36.

2. This variable is used in a new internal computation to convert minimum costs for any year to present worth. This new computation is made by multiplying the discounted costs by the sum of one plus the inflation rate to the power year. The computation of discounted costs on page 112 would then be changed as follows:

(add)	C	=	Annual inflation rate
(delete)	DC	=	$MC/(1+I)^y$
(add)	DC	=	$(MC)(1+C)^y/(1+I)^y$

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METRIC CONVERSION FACTORS

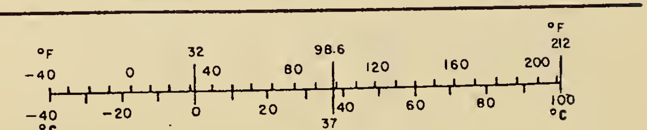
Approximate Conversions to Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
		LENGTH		
in	inches	*2.5	centimeters	cm
ft	feet	30	centimeters	cm
yd	yards	0.9	meters	m
mi	miles	1.6	kilometers	km
		AREA		
in^2	square inches	6.5	square centimeters	cm^2
ft^2	square feet	0.09	square meters	m^2
yd^2	square yards	0.8	square meters	m^2
mi^2	square miles	2.6	square kilometers	km^2
	acres	0.4	hectares	ha
		MASS (weight)		
oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
	short tons (2000 lb)	0.9	tonnes	t
		VOLUME		
tsp	teaspoons	5	milliliters	ml
Tbsp	tablespoons	15	milliliters	ml
fl oz	fluid ounces	30	milliliters	ml
c	cups	0.24	liters	l
pt	pints	0.47	liters	l
qt	quarts	0.95	liters	l
gal	gallons	3.8	liters	l
ft^3	cubic feet	0.03	cubic meters	m^3
yd^3	cubic yards	0.76	cubic meters	m^3
		TEMPERATURE (exact)		
°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

*1 in = 2.54 (exactly). For other exact conversions and more detailed tables, see NBS Misc. Publ. 286, Units of Weights and Measures. Price $2.25, SD Catalog No. C13.10:286.

Approximate Conversions from Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
		LENGTH		
mm	millimeters	0.04	inches	in
cm	centimeters	0.4	inches	in
m	meters	3.3	feet	ft
m	meters	1.1	yards	yd
km	kilometers	0.6	miles	mi
		AREA		
cm^2	square centimeters	0.16	square inches	in^2
m^2	square meters	1.2	square yards	yd^2
km^2	square kilometers	0.4	square miles	mi^2
ha	hectares (10,000 m^2)	2.5	acres	
		MASS (weight)		
g	grams	0.035	ounces	oz
kg	kilograms	2.2	pounds	lb
t	tonnes (1000 kg)	1.1	short tons	
		VOLUME		
ml	milliliters	0.03	fluid ounces	fl oz
l	liters	2.1	pints	pt
l	liters	1.06	quarts	qt
l	liters	0.26	gallons	gal
m^3	cubic meters	35	cubic feet	ft^3
m^3	cubic meters	1.3	cubic yards	yd^3
		TEMPERATURE (exact)		
°C	Celsius temperature	9/5 (then add 32)	Fahrenheit temperature	°F



INTRODUCTION

Pavements are subject to accelerated deterioration when exposed to heavy traffic. The deterioration creates a need for pavement maintenance and therefore freeway occupancy by maintenance forces. The maintenance is costly, difficult to perform and the occupancy creates conflicts with the motorist which impact on motorist operating cost, result in motorist delays, create increased opportunities for accidents and increased levels of pollution. The elimination of these costs and impacts can result in reduced highway maintenance expenditures and higher levels of safety, economy and convenience to the highway user.

This program was developed to analyze the magnitude of the cost associated with roadway occupancy.

General Description of Computer Program

The computer program developed for the Economic Analysis of Roadway Occupancy for Maintenance and Rehabilitation will be referred to as "EAROMAR". The program was designed to be:

1. Easily adaptable to the needs of the 50 State highway department and other highway agencies.
2. Readily updatable for changing unit cost.
3. A support program to existing pavement systems analysis.
4. Executable independent of the pavement systems analysis it was designed to support.
5. Easy to use.

The program's general structure is shown in Figure 1. In the broadest sense, the program does three things. First, it establishes

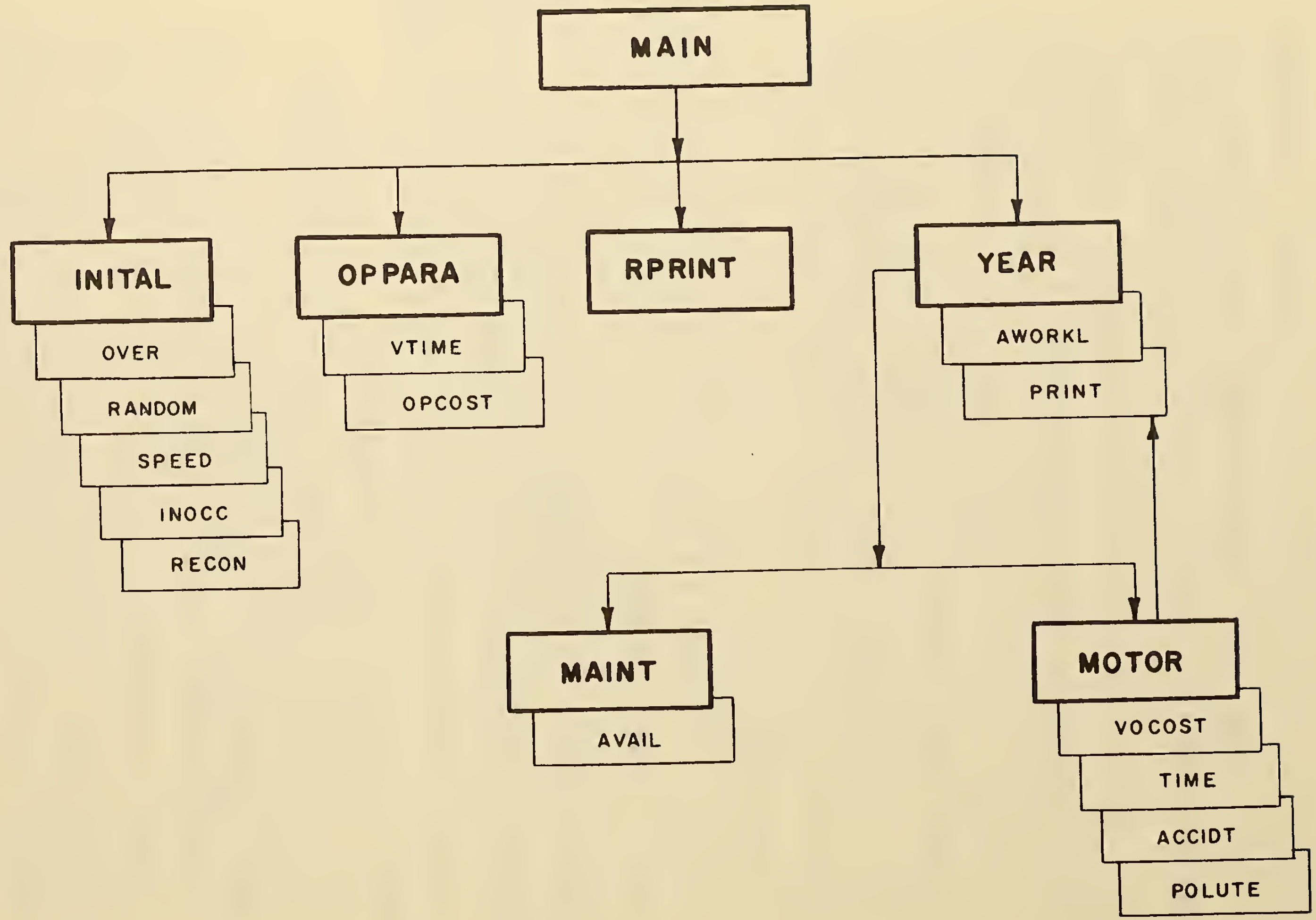


Figure 1 . General flow of computer program EAROMAR

a data matrix of given and assumed information. Second, it determines the specific hours the roadway will be occupied by work crews annually together with the maintenance and rehabilitation cost associated with that occupancy. Finally, the impact to the motorist caused by the roadway occupancy is established in terms of operation costs, time costs, accident cost and pollution effects.

Information Matrices

The data used in the program is created in the two subroutines INITAL and OPPARA. These two subroutines each contain a number of routines which were originally designed as subroutines but combined to effect a balance between the core requirement and run time necessary to execute the program. The program will run on any system configuration supporting 92K of available program storage.

The input data required to execute the program is minimal and consists of pavement design and traffic volume data. This insures that the program can be easily used by State agencies.

The majority of the data matrices are based on defaults, which are built into the program. However, each default can be optionally overridden by the program user. This is accomplished through the use of routine OVER which resides in subroutine INITAL. The other routines in INITAL are RECON, SPEED, RANDOM and INOCC. These establish an hourly volume matrix by trip purpose; a speed matrix by closure category; 1000 random full size and partial size patches and work site locations; and an available occupancy array, respectively.

The subroutine OPPARA consists of two routines. The first is VTIME which is an adaptation of the program developed by SRI in the development of their value of time tables (1). This routine creates a matrix of the hourly values of time by trip purpose for up to 40 increments of time loss.

The second routine, called OPCOST, creates a matrix of operation costs at 65 speeds for passenger cars and commercial vehicles.

Maintenance Simulation

A series of workload models, applicable to different pavement types, are used to generate maintenance activity workloads annually in the subroutine YEAR. Each activity is treated independently in the subroutine MAINT. Based on constraints applicable to each activity, the occupancy of the roadway by work crews is simulated. The occupancy requirement time is accumulated by the hour of the day and lane closure. Crew hours are accumulated and costed to produce activity costs. At intervals, which can be indicated through interfacing with a pavement systems program or controlled by the user, resurfacing is executed and the associated occupancy requirements and costs accumulated.

Subroutines YEAR and MAINT of the program EAROMAR were designed to permit maximum adaptability at the State level. The individual workload models can be factored, overridden or deleted completely. Each of the constraints built into the simulation process can be overridden by the user. The activity production and unit cost data can be

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[1]Thomas, Thomas C., Thompson, Gordon I., "The Value of Time Saved by Trip Purpose," Stanford Research Institute, Project MSU-7362, October 1970

based on local practices. Activities, not accounted for in the existing program, can be added by the user.

Motorist Impact

Through the maintenance simulation in subroutine MAINT the period of roadway occupancy for each activity is established for each feasible lane closure. In MOTOR, the impact on the motorist is evaluated in terms of reduced speeds, delays and volume changes hourly. These parameters are used in the routines VOCOST, TIME, ACCIDT and POLUTE to develop motorist impacts.

In VOCOST, the operation costs associated with a closure category are determined hourly. These are based on operation speed, delays and speed changes. The normal operation costs for the hour are computed and subtracted. The net difference is accumulated for all hours and days of roadway occupancy for each activity and closure category.

In TIME, the speed and delay information is used to develop a loss time per vehicle then held as loss manhours and dollars by activity and closure category.

ACCIDT is used to predict potential increases in accident numbers and costs. Finally, the added days of pollution are determined in the routine POLUTE.

In support of a pavement systems program "EAROMAR" is designed to select the closure category which produces the least overall costs for each activity. These are totaled for all activities and discounted for present worth in each analysis year.

The program also is executable independent of a pavement systems analysis. Print options available to the user permit output on each activity by lane closure category for each of the 7 following categories by roadway direction annually:

1. Activity costs
2. Operation cost
3. Accidents
4. Accident costs
5. Manhours loss
6. Time cost
7. Added days of pollution

DEFINITION OF TERMS

Activity	- A specific work function which is performed on the pavement, i.e., pavement patching, resurfacing, joint sealing, etc.
Activity Workload	- The quantifiable units of work generated for a work activity, e.g., square yards of patching, linear feet of crack sealing, lane miles of resurfacing, etc.
Available Occupancy Hours	- The hours of a day when work crews are permitted to occupy a roadway.
Closure Category	- A variety of lane closure sequences can be used in the delineation of work zones for activity work crews. Each closure sequence is defined as a closure category. As an example, on an eight-lane freeway, the following six sequences of closure categories are feasible: 1. Close one lane at a time 2. Close two lanes at a time 3. Close three, then one lane 4. Close all lanes and use shoulder 5. Close all lanes and use detour 6. Close all lanes and cross traffic over to opposite lanes

Directional Lanes	- The number of lanes going in a single direction for a given freeway, i.e., on an eight-lane freeway, there are four lanes in one direction.
Influence Zone	- The distance over which vehicles are operated at an average reduced speed due to lane closures on the freeway.
Lane Closure	- The number of directional lanes closed for a work activity, i.e., lane closure 1 is one lane closed, lane closure 2 is two lanes closed, etc.
Maintenance Level	- The number of periods in a year when the workload generated by a roadway will be taken care of. If 100 square yards of patching were the annual workload, then a maintenance level of one would mean that the road was occupied for one period to perform the annual work, i.e., work crews would be sent to the road every day until the total workload generated by the roadway had been taken care of by the work crews. A maintenance level of two would mean that at two periods in the year, the roadway would be occupied to perform work.

Maintenance Level (Cont.) - Further, only one-half of the annual workload would be available during each period. Finally, if the maintenance level was .2, then the road would only be occupied every fifth year. The workload generated each year would be continually accumulated until it could be taken care of in the fifth year.

Occupancy Interval Any continuous interval of time which is less than or equal to 24 hours when the roadway can be occupied. As an example, one occupancy interval could be a roadway occupancy which started at 8 A.M. and was terminated at 3 P.M. If crews reoccupied the road at 8 P.M. and stayed until 11 P.M., that would be a second occupancy interval.

Occupancy Period - A period of time when work crews occupy a roadway on a continual basis, i.e., at every occupancy interval opportunity. Where the maintenance level is greater than one, for example 3, the annual workload is divided into three parts. It requires an occupancy period to complete the workload for each of the three parts.

Pavement Analysis Age - The models predicting maintenance workload are a function of pavement age. A pavement deteriorates due to loadings and fails at a rate related to its design life. The workload models are based on a deterioration of the pavement over twenty years. The pavement analysis age is created for use in the workload models to accommodate axle loads and a design life which do not correspond to the twenty-year life associated with the models.

Pollution Day - The total emissions of CO and HC generated by vehicles operating normally on a freeway of a given length during a 24-hour period. The increase in emissions created during a roadway occupancy are converted into pollution days which therefore represent the days of normal operation required to generate the increased emissions caused by the roadway occupancy.

Simulation Workload	- The total units of work performed during the simulation process in subroutine MAINT. The simulation workload is controlled by the worksite workload and the number of interations specified for the simulation.
Worksite	- The spot location on the roadway where work crews perform productive work.
Work Zone	- The area on a roadway where work crews can actually perform work. The length of this zone does not include the cone taper used to channel traffic.

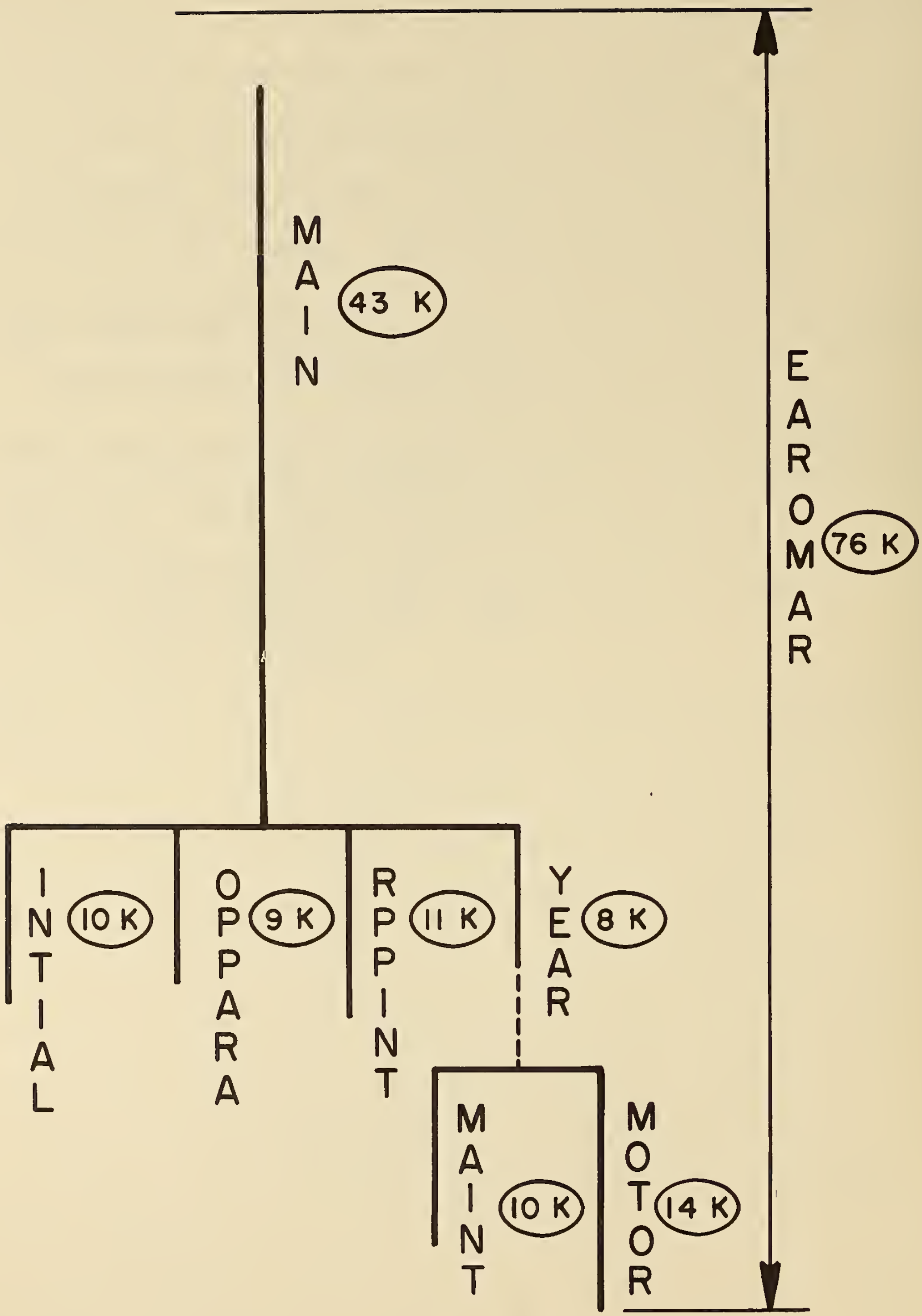


Figure 2. Layover structure tree for program EAROMAR

PROGRAM IMPLEMENTATION

The program "EAROMAR" is written in FORTRAN IV. The program was run and compiled using the IBM 360/65 computer facilities of the Federal Highway Administration. The program required 150K for compilation and runs in 76K. The program running time using the default options, a 20-year analysis period, portland cement concrete, and an eight-lane divided freeway, is about two minutes. Program compilation requires about one and one-half minutes.

NAME DICTIONARY

The name dictionary documents all switches, counters and accumulators and hold areas for the program 'EAROMAR'. The documentation provides a description, the units where applicable and an identification of each array, dimensioning and the identity of each array column and subscript value.

A	Equation intercept variable
AACOST	Average cost of an accident in dollars
AAXLES	Accumulated 18-kip axle loadings in millions
AC(5)	Scale factor used in the value of time equation for time loss less than 15 mins. by five trip purposes
ACD(7,3)	Intercept and coefficients for a series of accident rate equations COLUMN 1 1=One lane open freeway 2=Two lane open freeway 3=Three lane open freeway 4=Four lane open freeway 5=One lane open detour 6=Two lane open detour 7=Three + lane open detour 2 1=Intercept 2=Coefficient 3=Coefficient
ACDTS(4)	Increased accidents by lane closure
ACP(5)	Scale factor used in the value of time equation for time losses greater than 15 mins. by five trip purposes
AGE	Analysis age of pavement after adjustment for resurfacing or 18-kip axle loadings

ALIGN(3,6) — Project alignment mileage

COLUMN

1 — 1= + Grade
2= - Grade
3=Curvature

2 — Alignment values 1 thru 6 in percent or degrees, i.e., 1= + 1% grade, 2= + 2% grade, etc.

ARHO — Annual rate of 18-kip axle loadings needed to reach 1.5 PSI in 20 years based on AASHO in millions

AS(5,11) — Speed matrix in miles per hour

COLUMN

1 — Closure categories as follows

8 Lane	6 Lane	4 Lane
1=One ln closed	One ln closed	One ln closed
2=Two ln closed	Two ln closed	Detour
3=Three ln closed	Detour	Freeway
4=Detour	Freeway	
5=Freeway		

2 — Eleven increments of the volume capacity ratio from 0 to 1

AVOL(24) — Analysis volume by hour in 1000's

AVAIL — The number of hours which a crew is allowed to work continuously on roadway

AXLE — Given 18-kip axle loadings (this value is assigned through interfacing with a pavement systems deisgn program)

B — Equation coefficient

BIT(5) — Coefficient of income level and time savings where time loss is less than 15 minutes in the benefits functions by trip purpose

BITP(5) — Coefficient of income level and time savings where time loss is greater than 15 minutes in the benefits functions by trip purpose

BO(5) — Intercept value where the time loss is less than 15 minutes in the benefits functions by trip purpose

B02	Intercept value where the time loss is greater than 15 minutes in the benefits functions
BT(5)	Coefficient of time savings where the time loss is less than 15 minutes in the benefits functions by trip purpose
BTP(5)	Coefficient of time savings where the time loss is greater than 15 minutes in the benefits functions by trip purpose
C	Equation coefficient
CAP(5)	Capacity by lane closure in 1000's as defined for CCAP for a given freeway
CAPACT	Temporary label for closure category capacity
CCAP(5,3)	Capacity matrix in 1000's

COLUMN

1 Closure categories as follows

8 Lane	6 Lane	4 Lane
1=One ln closed	One ln closed	One ln closed
2=Two ln closed	Two ln closed	Shoulder
3=Three ln closed	Shoulder	Freeway
4=Shoulder	Freeway	
5=Freeway		

2 Freeway switch where

A. Switch 1=4 lane
B. Switch 2=6 lane
C. Switch 3=8 lane

CM	Material cost for an activity in dollars per workload unit
COMVOT	Value of commercial vehicle time in dollars

COSTS(7,5,8,2)	Accumulated costs and impact for year COLUMN 1 7 Activities 2 5 Closure categories 3 8 Print Column as follows: 1=Maintenance or rehabilitation 2=Operation cost difference 3=Accident cost difference 4=Accidents difference 5=Time costs 6=Time manhours lost 7=Pollution 8=Total costs 4 Two Directions
CPLANE	Temporary hold for closure category capacity
CREWH(4)	Total crew hours by lane closure
CREWT	Crew time available to occupy road in hours
CROSS(4)	Crossover factor by lane closure
CU	Cost of equipment and labor for a crew hour
CVOL	Daily commercial vehicle volume in 1000's
CWT	Commercial volume composite weight in kips
CYCLE	Temporary variable for DETOUR(6)
DAYS	The number of days of impact on motorist for a roadway occupancy interval
DELAY(24)	Vehicle delay in hours by hour
DENSEW	Density or concentration factor of workload per mile for a given lane closure

DETOUR(7)	Detour description parameters
DFACT	Factor used to modify freeway volume to create a combined freeway and detour volume
DIRECT(2,3)	Literal variables used in describing direction in output
DIST	Queue length in miles
DIST1	First worksite location within a traffic control zone
DIST2	Next worksite location on roadway
DIST3	Present worksite location within a traffic control zone
DLIFE	Pavement design life in years
DSPEED	Freeway design speed in mph
DVOL(24)	Directional normal hourly volume on detour in 1000's
END	Termination literal for input
ENOVER	Literal equal to "bEND"
FACT1	Temporary variable used for factoring in program
FACT2	Temporary variable used for factoring in program
FACT3	Temporary variable used for factoring in program
FACT4	Temporary variable used for factoring in program
FACT5	Temporary variable used for factoring in program
FACT6	Temporary variable used for factoring in program
FACT7	Temporary variable used for factoring in program
FACT8	Temporary variable used for factoring in program

FACT9	Temporary variable used for factoring in program
FCAP	The factored capacity of a road section, normal capacity reduced to reflect the passenger equivalent of commercial
FIXHRS	Hours which are not available for productive work when the roadway is occupied
FUEL(2)	Unit price of a gallon of fuel 1=Passenger cars 2=Composite commercial vehicle
HRS(7,24,4)	Hold area for days of occupancy by activity, by hour, by lane closure COLUMN 1 7 Activities 2 24 Hours 3 4 Lane closures
HVOL(24)	Directional normal hourly volume of traffic on freeway
HWORK(7)	Accumulated annual workload by activity (per lane mile)
I	Indexing variable
I1	Dummy read variable and indexer
I2	Dummy read variable
I3	Dummy read variable
IA	The subscript of the maintenance activity which is being processed by the program
IATEST	Temporary integer variable used to round ATEST

IBAL(7,2,2)	Indicator array used to flag input distributions COLUMN 1 7 trip purposes 2 2 directions 3 2 volume levels
IBEGIN	First impact hour of a given duration roadway occupancy
IC	Subscript used to denote the lane closure for maintenance 1=1 lane closed 2=2 lanes closed 3=3 lanes closed 4=4 lanes closed
ID	Subscript used to denote directional roadway
IDIR	Index used to acknowledge a balance in AM and PM peak hourly distributions 1=AM, peak direction 2=PM, peak direction
IEND	Last impact hour of a given duration roadway occupancy
IH	The subscript of the hour being processed by the program
IHOUR(24,7)	Each hour of this array has either a zero or one associated with it which indicates work can be performed (1) or is not permitted (0) during the subscribed hour COLUMN 1 24 hours 2 7 activities
IM1	A temporary hold variable in determining the available crew time
IM2	The first hour crews can occupy a roadway

IN1	Variable to hold 'from' occupancy hour in the establishment of the available occupancy time array IHOUR
IN2	Variable to hold 'to' occupancy hour in the establishment of the available occupancy time array IHOUR
INC	Income level switch used in computing the value of time 1 - Under $4000 2 - $4000-$5999/yr. 3 - $6000-$7999/yr. 4 - $8000-$9999/yr. 5 - $10000-$11999/yr. 6 - $12000-$14999/yr. 7 - $15000-$19999/yr. 8 - $20000 and over
INDEX	A variable used to indicate processing position
INOCC(10,3)	Assumed or specified allowable interval of time road can be occupied to perform maintenance COLUMN 1 Ten activities can be specified 2 Variable 1 - Activity number (Activity Number 10 is all activities) 2 - Occupancy start hour 3 - Occupancy termination hour
IP	Pointer switch used for optional input
IPRINT	Switch used to control analysis output 1=Direction level all 2=Year level all 3=Year level total 4=Analysis period total
IPTEST	Temporary integer variable used to round PTEST
IS	The subscript of the speed being processed by the program
ISIM	Number of simulation iterations

IT	Switch used to direct branch to proper array position by trip purpose 1=Pass. car work trips 2-Pass. car personal business trips 3=Pass. car social-recreational trips 4=Pass. car school trips 5=Pass. car vacation trips 6=Commercial vehicle trips 7=All trips
ITEST	Variable used to temporarily round numbers in reconcile
ITOTAL(5,8,2)	Output totals COLUMN 1 5 closure categories 2 8 print columns 1=Maintenance and rehabilation cost 2=Operation cost 3=Time cost 4=Time hours 5=Accidents 6=Accident costs 7=Pollution days 8=Total costs
ITRUCK	Variable used to temporarily round percent of commercial vehicles
IW	Indexing variable for the simulation process
IWT	Number vehicle classes (Max 10)
IY	Subscript of analysis year being processed by the program

J	Indexing variable
J1	Indexing variable
JHOUR(24)	The array 'IHOUR' of available occupancy hours for a activity modified for v/c ratio restrictions
JPRINT	Switch to control printing of program input and informational matrices 1=Print 2=Do not print
K	Indexing variable
KP	Switch for highway design being considered 1=4-lane 2=6-lane 3=8-lane
LANES	The number of expressway lanes in one direction
LEVEL	Switch used to direct branch to proper array 1=Initial year volume 2=Final year volume
LF	A factor used to increase simulation workload to reflect that the worksite workload is being factored by the number of lanes closed
M	Temporary switch and DO loop limiting variable
MI	Last even hour available for road occupancy in simulation process
MI	Data reference set number card reader 'input'
MO	Data reference set number printer 'output'

N	Temporary switch and indexing variable
N1	Counter for the random generation of full depth patch sizes
N2	Counter for the random generation of partial depth patch sizes
N3	Counter for the random generation of roadway patch locations
NA	Level of maintenance factor
NOTIME	An index used to indicate that no roadway occupancy hours are available. No occupancy occurs and output for closure category shows stars.
NY	A positive odd number used in the random number process
NYEARS	Number of years to be analyzed
NZ	Number of traffic control zones for a given activity and lane closure
OCOST(65,4,2)	Array holding operation parameters for given roadway COLUMN 1 65 speeds 2 1=Fuel consumption 2=Tire wear 3=Oil consumption 4=Maintenance and depreciation cost 3 1=Passenger cars 2=Commercial vehicles
OCOSTS(65,4,2)	Array holding the operation cost associated with fuel, oil, tires, maintenance and depreciation COLUMN 1 65 Speeds 3 1=Passenger cars 2=Commercial vehicles
OCSCHL	Average occupancy per vehicle on school trips

OCWORK	Average occupancy per vehicle on work trips
OIL(2)	Unit cost of a quart of oil 1=Passenger cars 2=Composite commercial vehicle
OVER(12,7)	An array holding program parameters which are assigned by the program or can be specified by the user COLUMN 1 - Type of parameter 1=Continuous crew work hours 2=Location or joint spacing in feet 3=Workload model factor 4=Workload model fixed annual rate 5=Travel time hours (round trip) 6=Maintenance level 7=Cure time hours 8=Traffic control installation hours 9=Max. TC length 10=Vol/Cap ratio allowed 11=Min TC length 12=Shoulders open to traffic COLUMN 2 - 7 Activities
P	Speed used in pollution factor equations
PATCHF(1000)	The array holding 1000 random generated full size patches
PATCHP(1000)	The array holding 1000 random generated partial depth concrete patches
PAVE(3,3)	Literal variable used for pavement description in output printing
PCTADT(24,7,2,2)	Hourly distribution of traffic by trip purpose, direction, and volume level EVALUATION* LEVEL 1 100% distributions for each trip purpose for Initial and Final volume levels in both directions 2 100% distributions adjusted by distribution of trip purposes for Initial and Final volume levels in both directions

3 Base year distribution and add on array for each trip purpose and direction

PD — Pollution factor for normal detour operation

PERCNT(6,2,2) — Distribution of traffic among trip purposes

COLUMN

1 6 Trip purposes
2 2 Directions
3 2 Volume levels
1 Initial volume
2 Final volume

PFACT — Factor to convert patch length to area in square yards

POLUTE(4) — Pollution equivalent normal vehicle miles by lane closure

PQ — Pollution factor for operation in the queue

PR — Pollution factor for operation in the influence zone

PROJLN — Length of pavement section being designed in miles

PS(7,3,3) — Performance standard data for costing maintenance activity

COLUMN

1 7 Activities

2 Pavement Type

1=Portland cement concrete
2=Bituminous concrete
3=Composite

3 1=Labor & equipment hourly cost
2=Material cost per workload unit
3=Production rate in workload units per hour

PSI — Present serviceability index

PSIASN — Assigned initial PSI for analysis

PSIRS — The PSI value below which resurfacing occurs

PWT — Passenger car weight in kips

QUECST(2)	The operation cost associated with the delay created by a queue 1=Normal operation cost in queue zone in dollars per hour 2=Actual operation cost in the queue in dollars per hour
Q1	Composite passenger-commercial speed change costs
RAGE	Resurfaced Age
RANDOM(2)	A random number which falls between 0.00 and 1.00 Position 1 is used to create an X value to be used in a density function. Position 2 is used to test the number generated from a density function.
RATEI	Interest rate on money used in present worth computation in percent
RHO	AASHO based 18-kip loadings to produce 1.5 PSI in millions
RLIFE	Design life of resurfaced pavement in years
RLOC(1000)	Array holding 1000 random numbers from 0-1.0
ROAD(2,3)	Literal variable used for freeway description in output printing
RTIME	Real remainder = balance of roadway occupancy time in simulation process
RW	Weight Ratio factor to convert operation parameters for a base passenger vehicle to any weight vehicle
S	Speed value used in equations of speed change
SCZONE	An assumed speed change zone equal to one mile used in evaluation of accident rates
SF	Spacing increment used to accumulate stationing for uniformly spaced worksites
SFACT	A factor to be applied to the random location array to adjust it for the number of simulation iterations specified for an activity

SIM(7,5) Descriptor for simulation process

COLUMN

1 7 Activities
2 1=Worksite switch
  1=Full depth patch
  2=Partial depth patch
  3=Lanes closed
2=Worksite size multiplier factor
3=Worksite size add on constant
4=Number of simulation iterations
5=Worksite spacing switch
  1=Random spacing
  2=Uniform spacing

SINDEX Services index used to modify vehicle operation

SLIMIT(5) Speed limit in mph assigned to closure category

SP(5,11) Speed matrix

COLUMN

1 Closure category

8 Lane	6 Lane	4 Lane
1=One ln closed	One ln closed	One ln closed
2=Two ln closed	Two ln closed	Detour
3=Three ln closed	Detour	Freeway
4=Detour	Freeway	
5=Freeway		

SPEED(24) Vehicle speed through traffic influence zone by hour

SPEEDD(24) Normal vehicle speed on detour by hour

SPEEDN(24) Normal vehicle speed on freeway by hour

SPLIT(2) The percentage of daily traffic in the AM Direction

EVALUATION* LEVEL	Column
1	1 Initial year 2 Final
2	1 Base year 2 Annual increment
3	1 Analysis year

SS	Real version of IS, speed subscript
SSIM(3,7,5)	Descriptor for simulation process

COLUMN

1 Pavement type

1=PCC
2=Bituminous
3=Composite

2 7 Activities

3 1=3 Worksite types where

1=Full size patch
2=Partial size patch
3=Lanes closed

2=Worksite size multiplier factor

3=Worksite size add-on constant

4=Number of simulation iterations

5=1=Random locations
2=Uniform locations

STIME	Total road occupancy time in hours
SWORK(7)	Simulation workload by activity
TCMOVE	Travel speed between TC sites
TCMOVE	Driving speed between traffic control site
TEMP1	Variable used for holding numbers temporarily in program
TEMP2	Variable used for holding numbers temporarily in program
TEMP3	Variable used for holding numbers temporarily in program
TEMP4	Variable used for holding numbers temporarily in program
TEMP5	Variable used for holding numbers temporarily in program
TEMP6	Variable used for holding numbers temporarily in program
TEMP7	Variable used for holding numbers temporarily in program

TEST	Variable used for temporarily holding sums in reconcile routine
THICK	Equivalent pavement thickness
THICK1	The thickness of pavement surface
THICK2	The thickness of pavement base
THICK3	The thickness of pavement subbase
TIME	Hours required to complete work at a given worksite location
TIME1	The delay time associated with the first vehicle in a given hour
TIME2	The delay time associated with the last vehicle in a given hour
TIMEL	Hours lost by each freeway motorest
TIMELD	Hours lost by each detour motorest
TIRES(2)	Unit cost of .001 inches of tire wear 1=Passenger cars 2=Commercial vehicles
TLEVEL(7)	Accumulation area for maintenance levels which are less than 1 by activity
TOTALA(8)	Totals for analysis period discounted to present worth
TOTALY(8)	Minimum totals for analysis year discounted to present worth
TRUCKS(2)	Percentage of total traffic volume which is commercial in percent

EVALUATION* LEVEL	Column
1	1 Initial analysis year 2 Final analysis year
2	1 Base year 2 Annual
3	1 Analysis year

TT	Temporary hold variable for crew travel time in hours from maintenance yard to road and return
TTIME	Accumulated production hours for each roadway occupancy
VALUE	Dummy read variable
VC	Volume-capacity ratio
VOLUME(2)	Average daily traffic volume in thousands

EVALUATION*

LEVEL	Column
1	1 Initial analysis year 2 Final analysis year
2	1 Base year 2 Annual increment
3	1 Analysis year

VTRATE(5,40) Value of time array

COLUMN

1 Five trip purposes where

1=Work trips
2=Social-recreational
3=Personal business
4=Vacation
5=School

2 40 minute increments

W	Product of the annual workload per lane mile for a given activity and project length in miles divided by the simulation workload
WALK	Rate crews move on road between repair location (MPH)
WEIGHT(10,3)	Vehicle weight array

COLUMN

1 Each vehicle class

	2 1=Weight in kips 2=Percent of commercial vehicle in given weight class 3=Average purchase price of vehicle in dollars
WIDTH	The assumed or given width of a roadway lane in feet
WK	Workload density per lane mile for a given occupancy simulation
WORK	Annual computed workload
XF	The length of a full depth patch in feet
XP	The area of a partial depth patch in square feet
YD	A number computed from a density function
Z(24)	Dummy read variable
ZC	Zone length constant for one worksite location (minimum zone length)
ZL	Accumulated length of traffic control zone for a given activity and lane closure
ZONE	Applicable influence zone (freeway or detour)
ZONEL(7,4)	The average length of influence zone

*Evaluation level means that the contents of the array changes at various points in the program process

Table 1 . Scalars and arrays in common

VARIABLES	Subroutines and routines																				
	MAIN	INITAL	OVER	RANDOM	SPEED	INOCC	RECON	OPPARA	VTIME	OPCOST	RPRINT	YEAR	AWORKL	PRINT	MAINT	AVAIL	MOTOR	VOCOST	TIME	ACCIDT	POLUTE
AACOST	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-
ALIGN	X	-	X	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-
ARHO	-	X	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-
CAP	-	X	X	-	X	-	-	-	-	-	X	X	-	-	X	-	X	-	-	-	-
COMVOT	X	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	X	-	-
COSTS	-	-	-	-	-	-	-	-	-	-	-	-	-	X	X	-	X	-	-	-	-
CWT	-	-	-	-	-	-	-	-	-	X	X	-	-	-	-	-	-	X	-	-	-
DETOUR	X	-	X	-	X	-	-	-	-	-	X	X	-	-	-	-	X	X	X	X	X
DLIFE	X	-	-	-	-	-	-	-	-	-	X	-	X	-	-	-	-	-	-	-	-
DVOL	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	X	X	X	X	X
FUEL	X	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	X	-	-	-
HRS	X	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	X	-	-	-	-

Table 2 . Scalars and arrays in common

VARIABLES	MAIN	INITAL	OVER	RANDOM	SPEED	INOCC	RECON	OPPARA	VTIME	OPCOST	RPRINT	YEAR	AWORKL	PRINT	MAINT	AVAIL	MOTOR	VOCOST	TIME	ACCIDT	POLUTE
	Subroutines and routines																				
HVOL	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	X	X	X	X
HWORK	X	-	-	-	-	-	-	-	-	-	-	-	X	-	X	-	-	-	-	-	-
ID	-	-	-	-	-	-	-	-	-	-	-	X	-	X	X	-	X	X	X	X	X
IDIR	X	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-
IHOUR	-	-	-	-	-	X	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-
INC	X	-	X	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-
IPRINT	X	-	X	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-
ITYPE	-	X	-	X	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-
IWT	X	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-
IY	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-
JPRINT	X	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KP	-	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-

Table 3 . Scalars and arrays in common

VARIABLES	MAIN	INITIAL	OVER	RANDOM	SPEED	INOCC	RECON	OPPARA	VTIME	OPCOST	RPRINT	YEAR	AWORKL	PRINT	MAINT	AVAIL	MOTOR	VOCOST	TIME	ACCIDT	POLUTE
LANES	-	X	-	-	X	-	-	-	-	-	-	-	-	-	X	-	X	X	X	X	X
MI	X	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MO	X	-	-	-	-	-	-	-	-	-	X	-	-	X	-	-	-	-	-	-	-
NYEARS	-	X	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-
OCOSTS	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-
OCSCHL	X	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-
OCWORK	X	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-
OIL	X	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	X	-	-	-
OVER	X	X	X	X	-	X	-	-	-	-	X	-	X	-	X	-	X	-	-	-	-
PATCHF	-	-	-	X	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-
PATCHP	-	-	-	X	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-
PCTADT	X	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 4 . Scalars and arrays in common

VARIABLES	MAIN	INITAL	OVER	RANDOM	SPEED	INOCC	RECON	OPPARA	VTIME	.OPCOST	RPRINT	YEAR	AWORKL	PRINT	MAINT	AVAIL	MOTOR	VOCOST	TIME	ACCIDT	POLUTE
	Subroutines and routines																				
PROJLN	-	X	-	-	-	-	-	-	-	X	X	-	-	-	X	-	X	-	-	-	X
PS	X	-	X	-	-	-	-	-	-	-	X	-	-	-	X	-	-	-	-	-	-
PSIRS	X	-	X	-	-	-	-	-	-	-	X	-	X	-	-	-	-	-	-	-	-
QUECST	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-
RATEI	X	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-
RLIFE	X	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-
RLOC	-	-	-	X	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-
SIM	-	X	X	-	-	-	-	-	-	-	-	-	X	-	X	-	-	-	-	-	-
SINDEX	X	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	X	-	-	-
SLIMIT	X	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SP	-	-	-	-	X	-	-	-	-	-	-	X	-	-	-	-	X	-	-	-	-
SPEEDD	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	X	-	-	-	-

Table 5 . Scalars and arrays in common

VARIABLES	Subroutines and routines																				
	MAIN	INITIAL	OVER	RANDOM	SPEED	INOCC	RECON	OPPARA	VTIME	OPCOST	RPRINT	YEAR	AWORKL	PRINT	MAINT	AVAIL	MOTOR	VCOST	TIME	ACCIDT	POLUTE
SPEEDN	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	X	-	-	-	-
SPLIT	-	X	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-
SWORK	-	-	-	X	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-
TCMOVE	X	-	X	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-
TIRES	X	-	X	-	-	-	-	-	-	X	-	-	-	-	-	-	-	X	-	-	-
TLEVEL	X	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-
TRUCKS	-	X	-	-	-	-	-	-	-	-	-	X	X	-	-	-	-	-	-	-	-
VOLUME	-	X	-	-	-	-	-	-	-	-	-	X	X	-	-	-	-	-	-	-	-
VTRATE	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	X	-	-
WALK	X	-	X	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-
WEIGHT	X	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-
WIDTH	X	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-
ZONEL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	X	-	-	-	-

Program EAROMAR - MAIN

Purpose

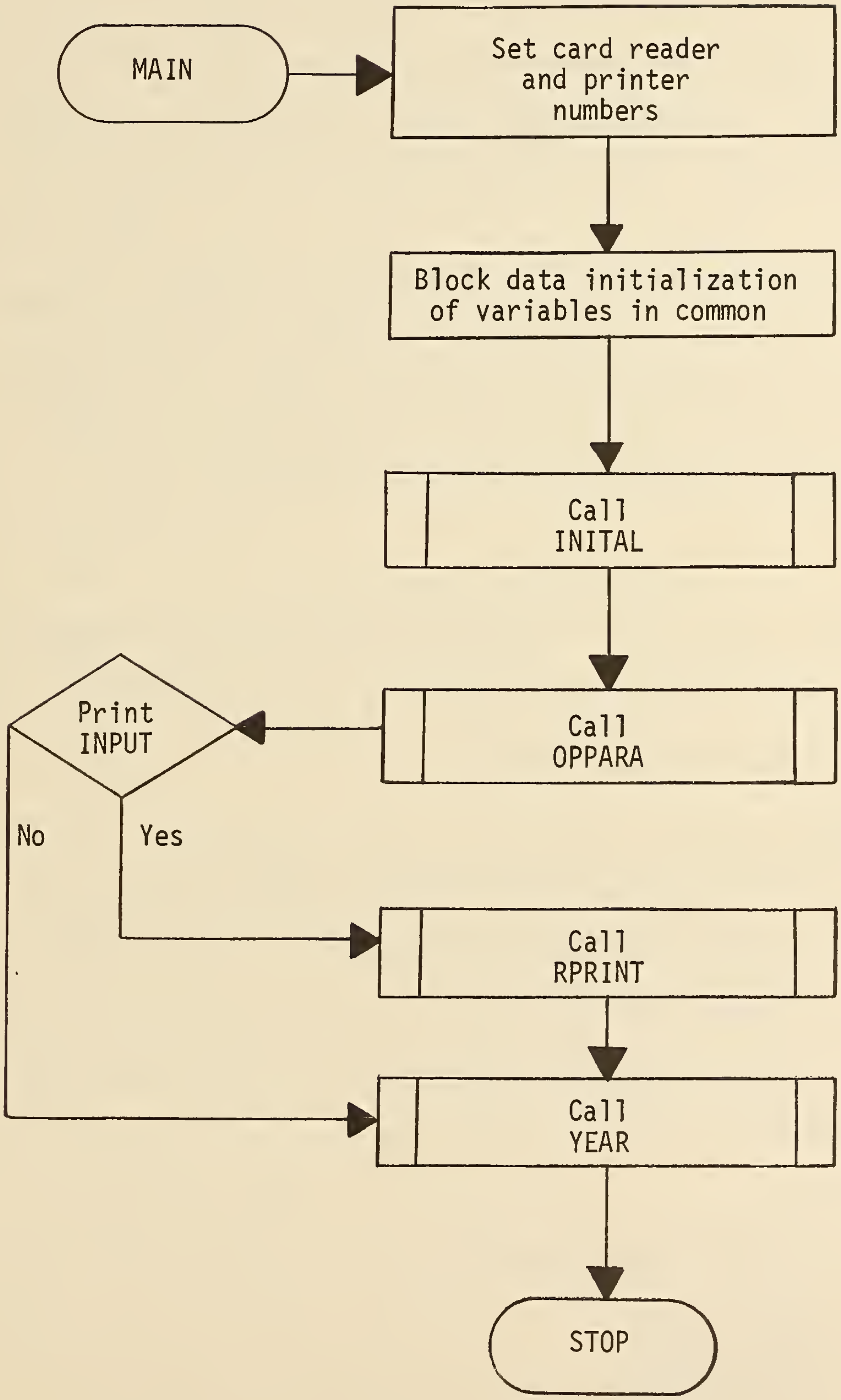
MAIN controls the sequence in which the subroutines are called.

Description

MAIN is kept as small as possible to minimize the core requirement. MAIN calls the subroutines INITAL and OPPARA to establish the initialization of arrays and variables needed in the analysis. Following the initialization process, YEAR is called, and the analysis of roadway occupancy performed.

A complete printout of the initialization information is available on request through the print option JPRINT, which is set to default the initialization printout.

General Flow for MAIN in Program "EAROMAR"



SUBROUTINE INITAL

Purpose

This subroutine is used to establish a series of basic arrays needed in the economic analysis of roadway occupancy for maintenance and reconstruction (EAROMAR). The routines OVER, RECON, SPEED, INOCC and RANDOM reside in this subroutine. Each of these routines are described in detail by themselves. OVER handles all user override inputs, SPEED is used to develop a speed matrix for each closure category. RANDOM and INOCC create arrays needed in the simulation subroutine MAINT, and RECON establishes an hourly traffic volume array by trip purpose and direction. The subroutine INITAL itself handles all required program input.

Description

The subroutine INITAL reads information on the pavement design and on the expected traffic which is required in the program "EAROMAR". This required input consists of the following:

<u>Volume Input</u>

A. Initial and final analysis year traffic volume in ADT

B. Initial and final analysis year directional split in terms of the percentage in the AM peak

C. Initial and final analysis year commercial vehicle percentage of total ADT

<u>Pavement Input</u>

A. Number of years to be analyzed

B. Freeway class where
  1 = 4 lane divided
  2 = 6 lane divided
  3 = 8 lane divided

C. Pavement type where
   1 = Portland Cement Concrete
   2 = Bituminous Concrete
   3 = Composite PCC-Bituminous

D. Project length in miles

E. Pavement surface, base and subbase thickness in inches

The following variables are initialized with default values in the subroutine INITAL:

A. SSIM - Simulation parameters by activity for concrete, bituminous and composite pavement

B. PERCNT - The percentage of total traffic falling into one of six trip purposes by direction and for an initial and final analysis year

C. INOCC - Available occupancy specifications

D. DSPEED - The freeway design speed

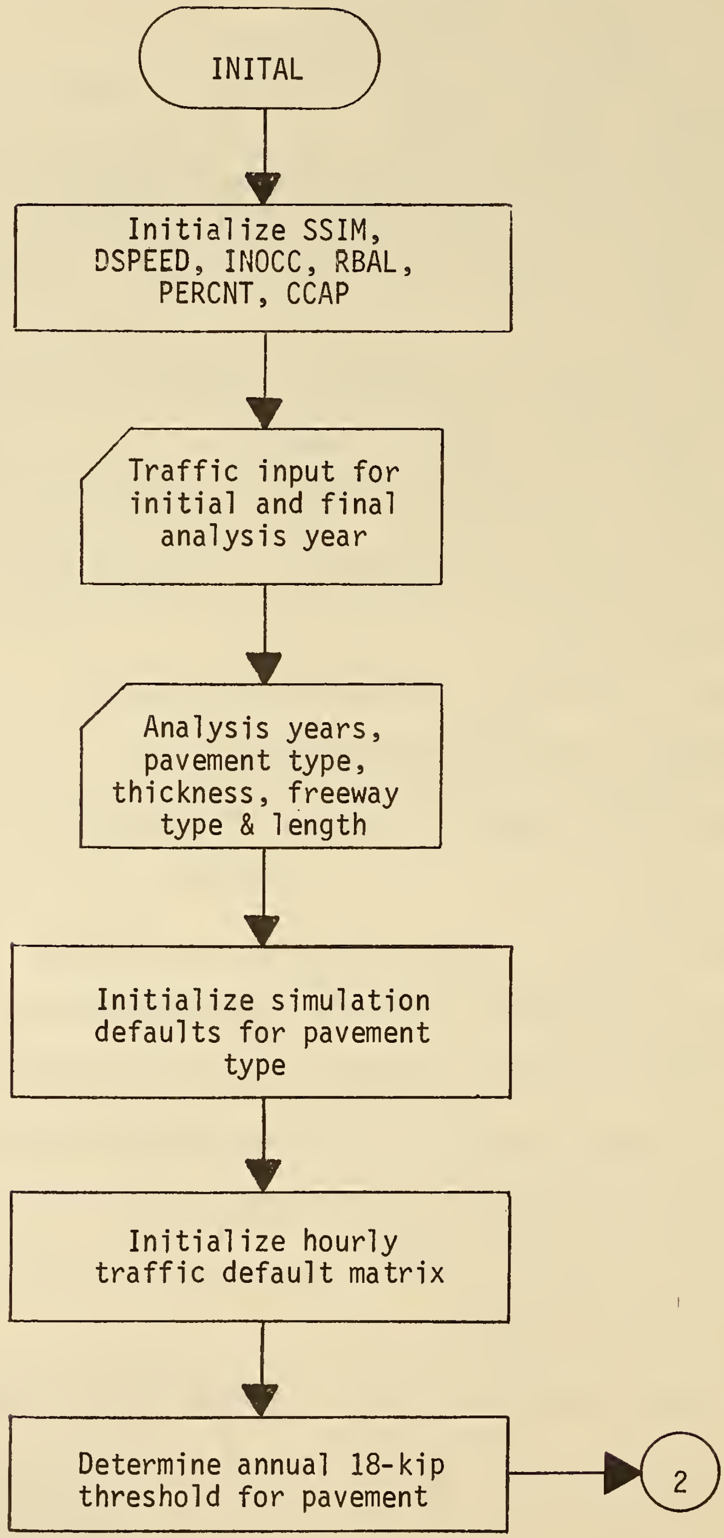
E. CCAP - The capacity by closure category for 4, 6 and 8 lane freeways

Following the required input, which identifies pavement type, the appropriate simulation parameters SSIM and capacities CCAP are placed in the common arrays SIM & CAP for use in the subroutines YEARS and MAINT.

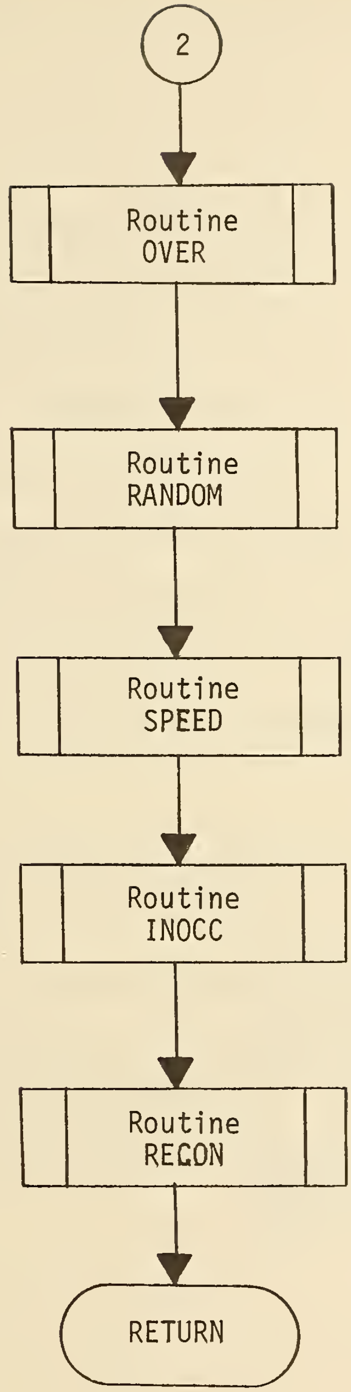
Based on AASHO equations, the subroutine INITAL calculates the 18-kip accumulated axles required to fail pavement (reach a PSI of 1.5) which is divided by 20 and placed in common for use in the routine AWORKL which resides in subroutine YEAR.

INITAL then proceeds to execute routines OVER, RANDOM, SPEED, INOCC and RECON.

General Flow for Subroutine INITAL in Program 'EAROMAR'



INITAL cont'd.



SUBROUTINE: INITAL

ROUTINE: OVER

Purpose

This routine reads as optional input,overrides specified by the program user. Each of the overrides has been initialized with default values. This initialization occurs in BLOCK DATA for all labeled common variables used in the program "EAROMAR". The remaining options are initialized with default values in the subroutine, INITAL.

The input format for override options available to the program user are described in detail in the section covering optional input format and description. They can be specified in any order by the user. The override switch determines how the optional input is read by the program.

The input options for overriding variables are as follows:

Switch = 1 - Hourly volume distribution by trip purpose

The array PCTADT is initialized with hourly distributions for each of six trip purposes. These are:

1. Work trips
2. Personal business trips
3. Social-recreational trips
4. School trips
5. Vacation trips
6. Commercial trips

The initialization default distributions are shown in Figures 3 through 10 . The program user, at his option, can override one or all of these distributions.

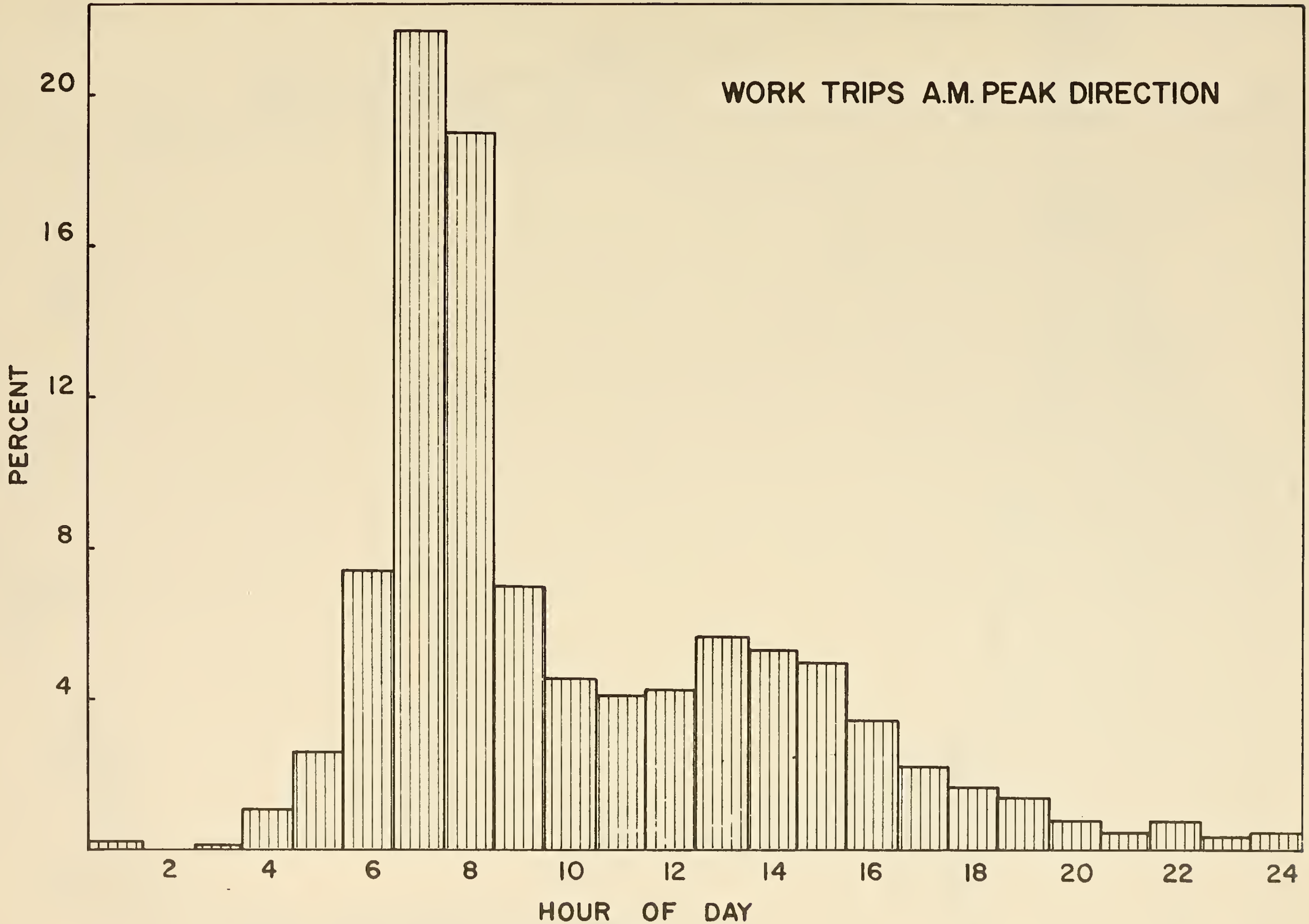


Figure 3. Distribution of work trip A.M. peak direction

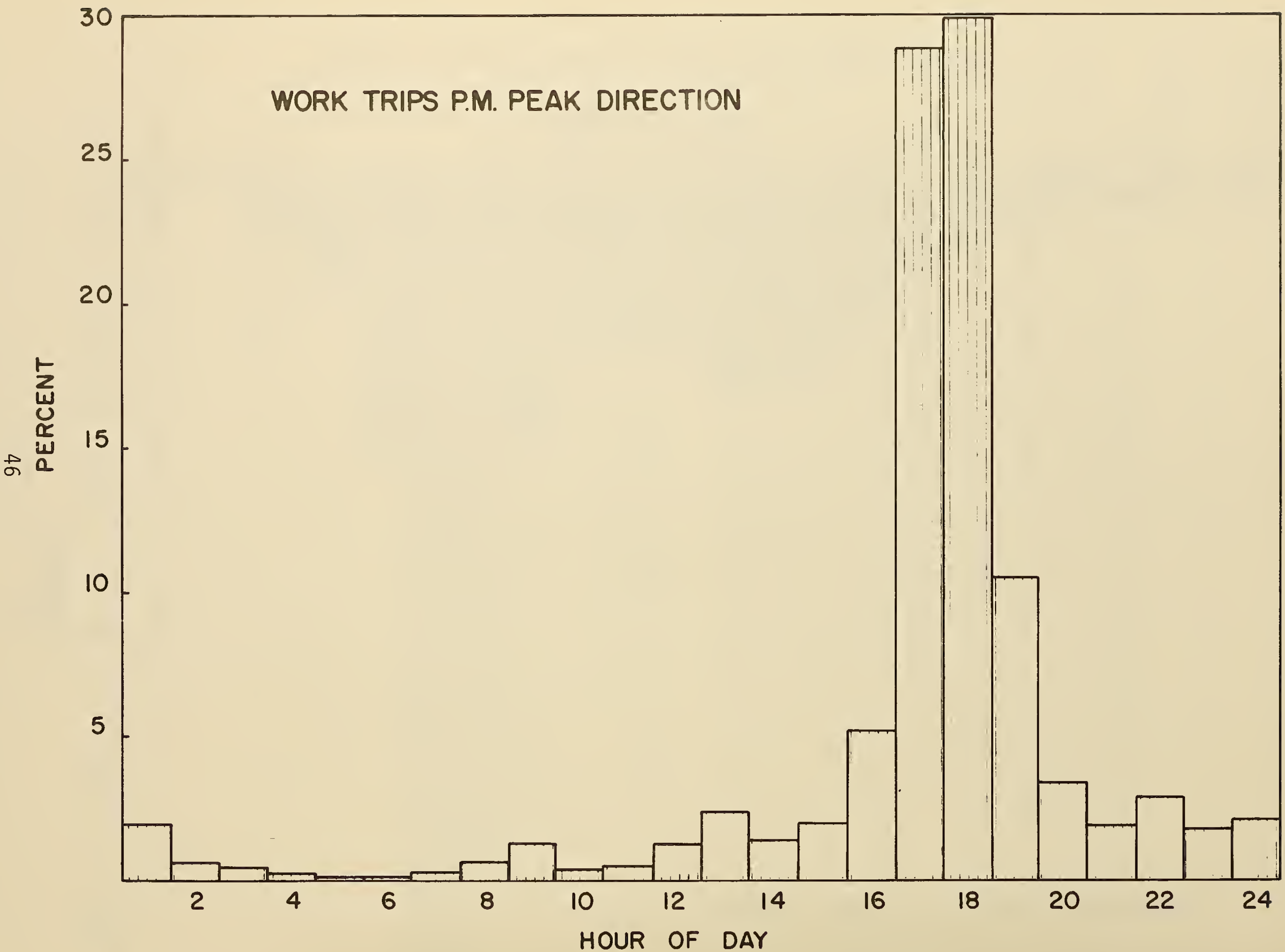


Figure 4. Work trips P.M. peak

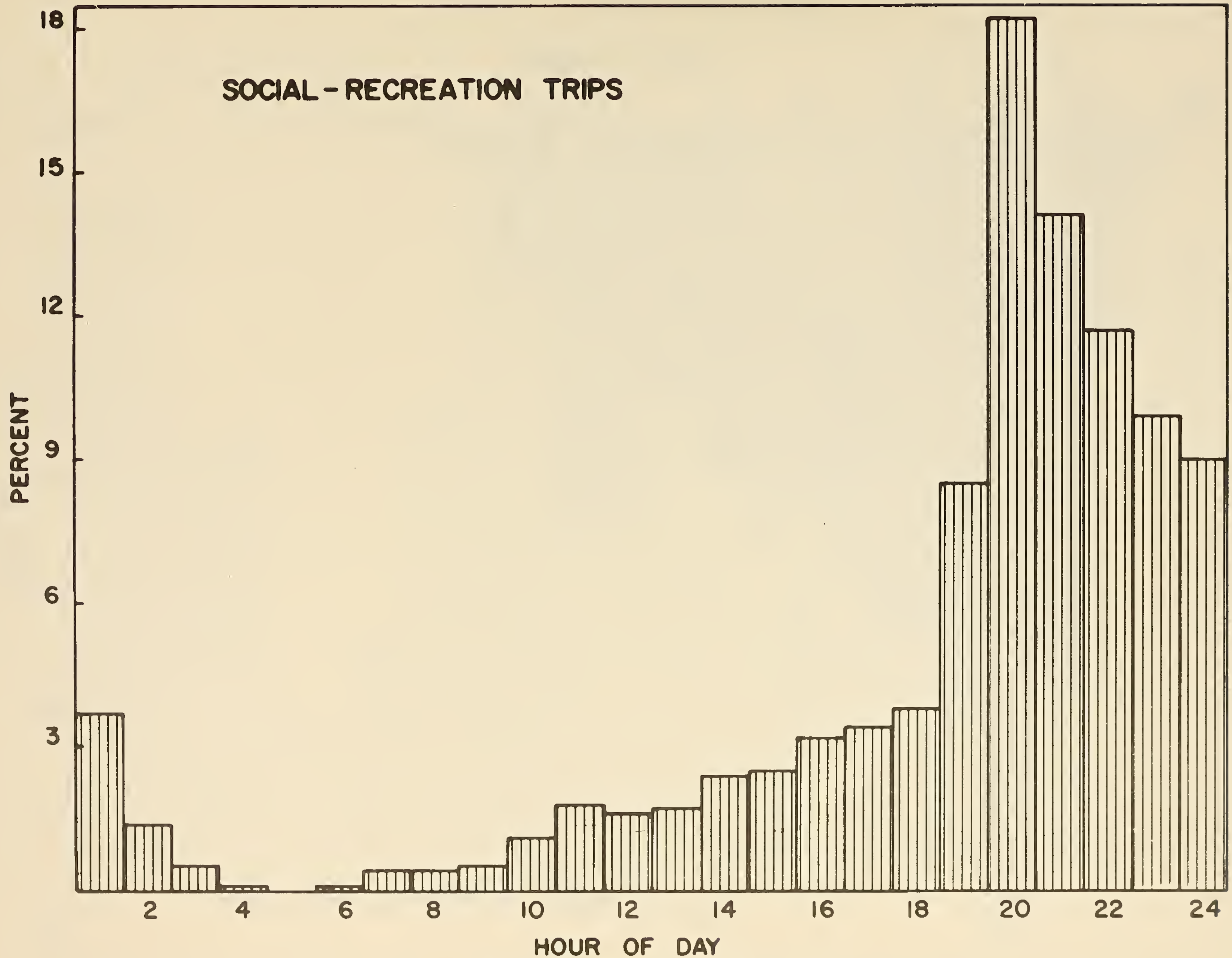


Figure 5. Social-recreational trips

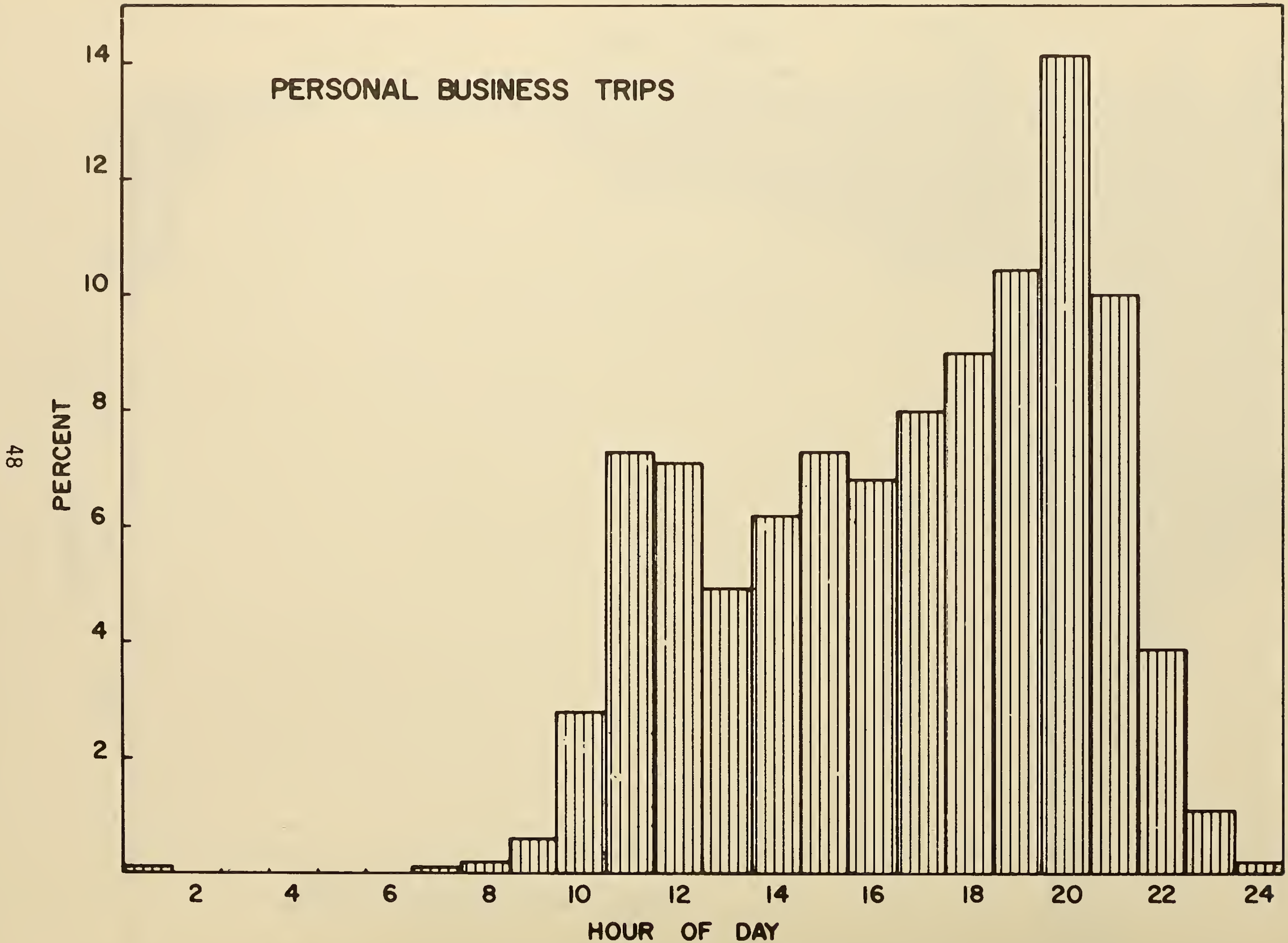


Figure 6. Personal business trips

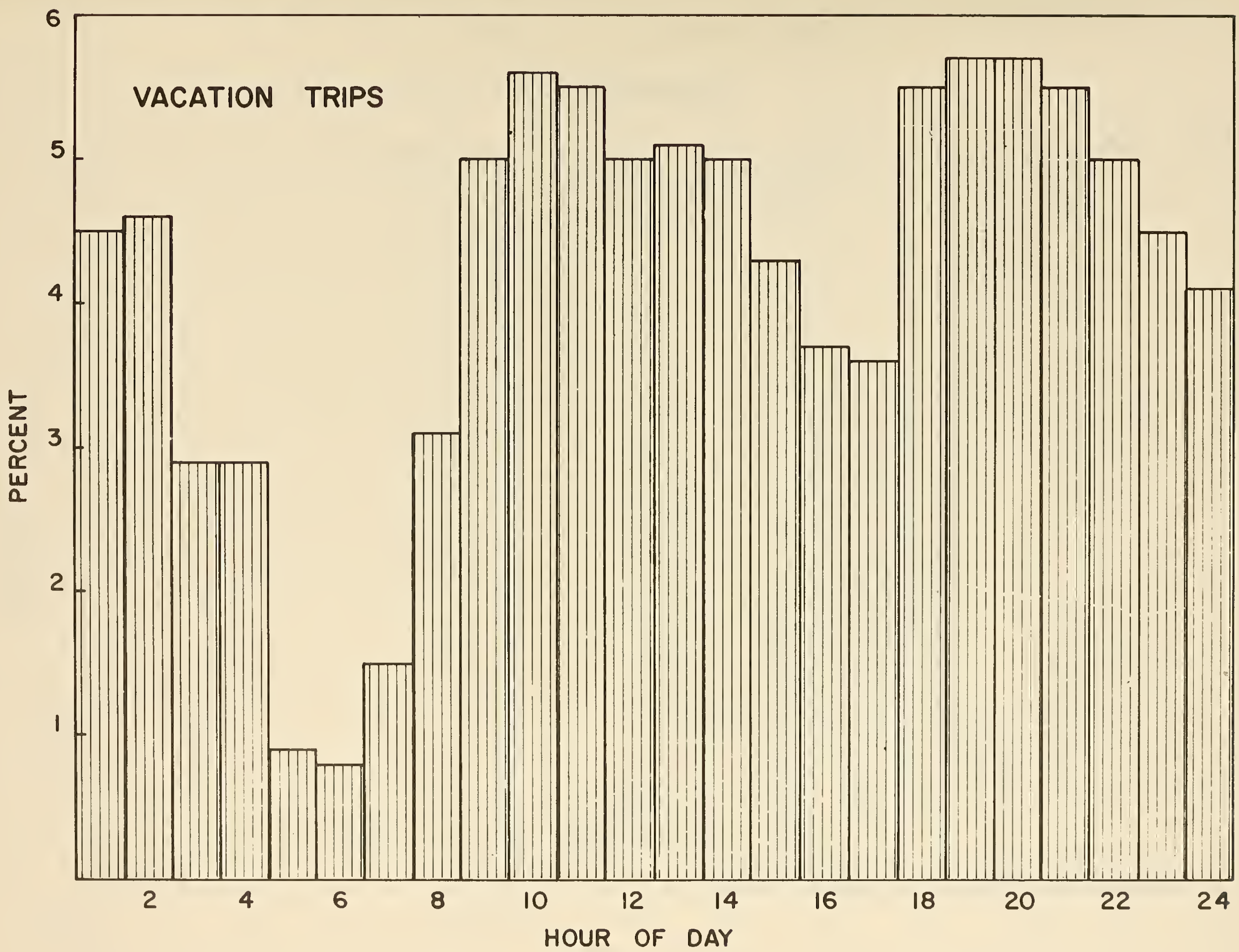


Figure 7. Vacation trips

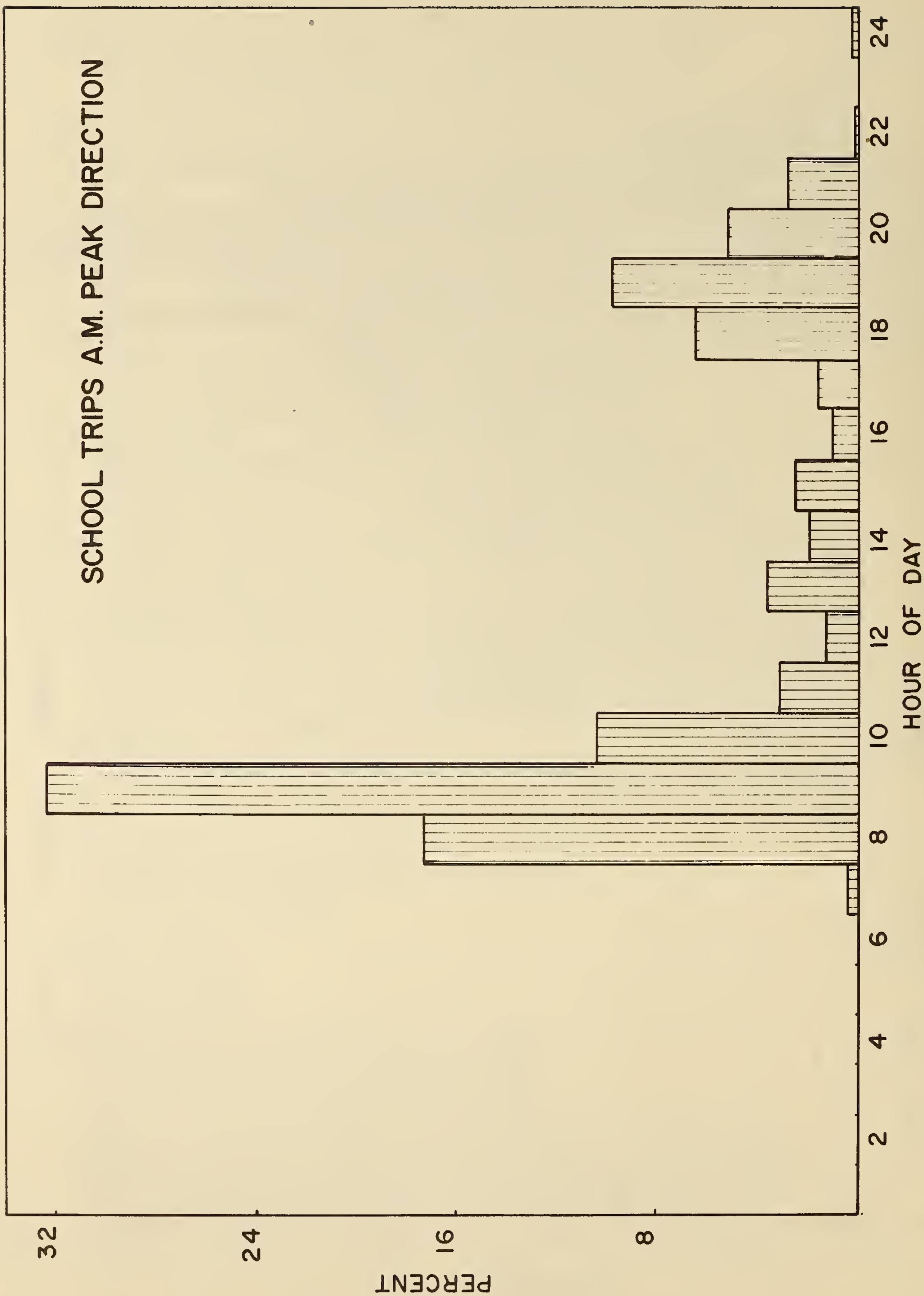


Figure 8. A.M. School trips

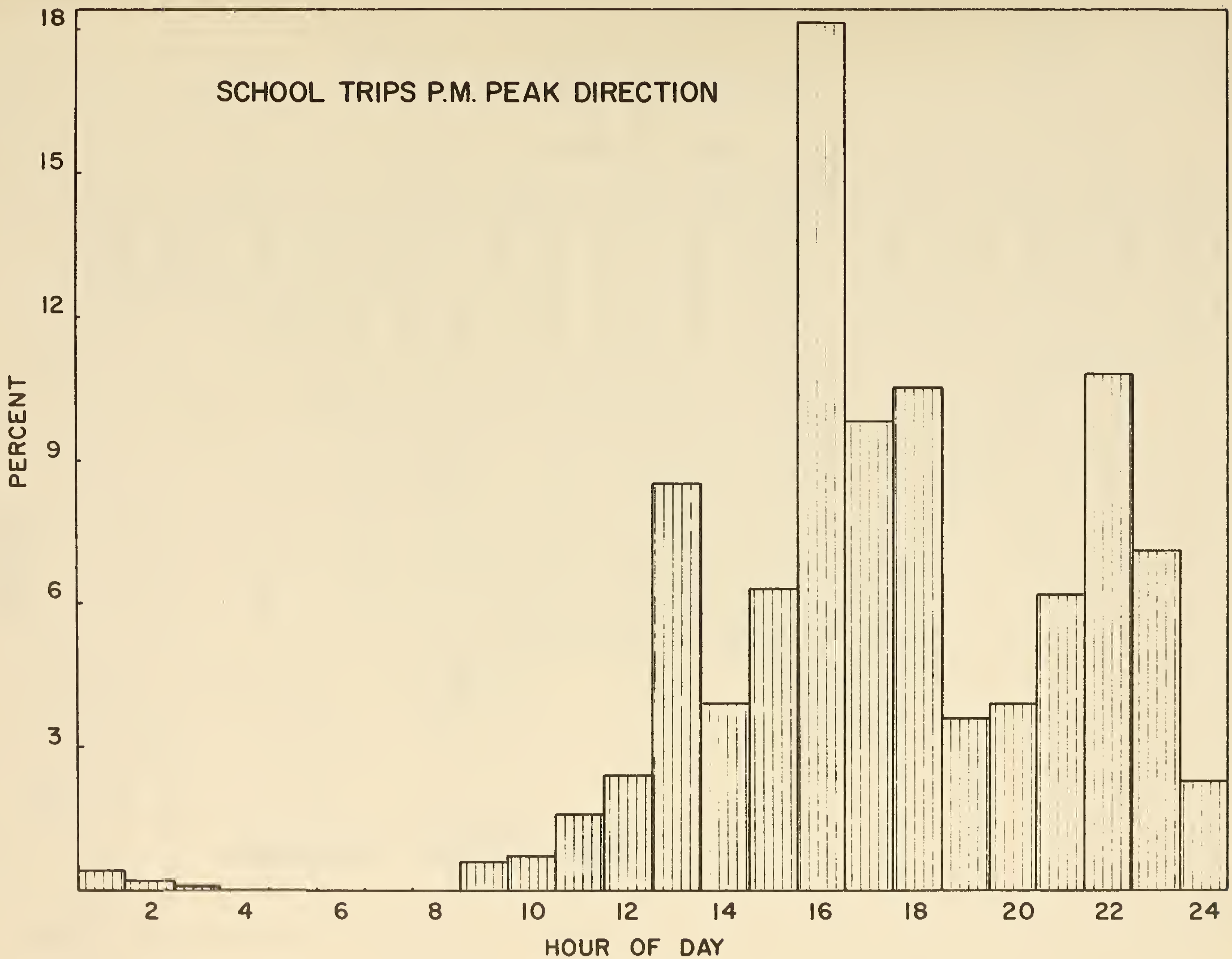


Figure 9. P.M. School trips

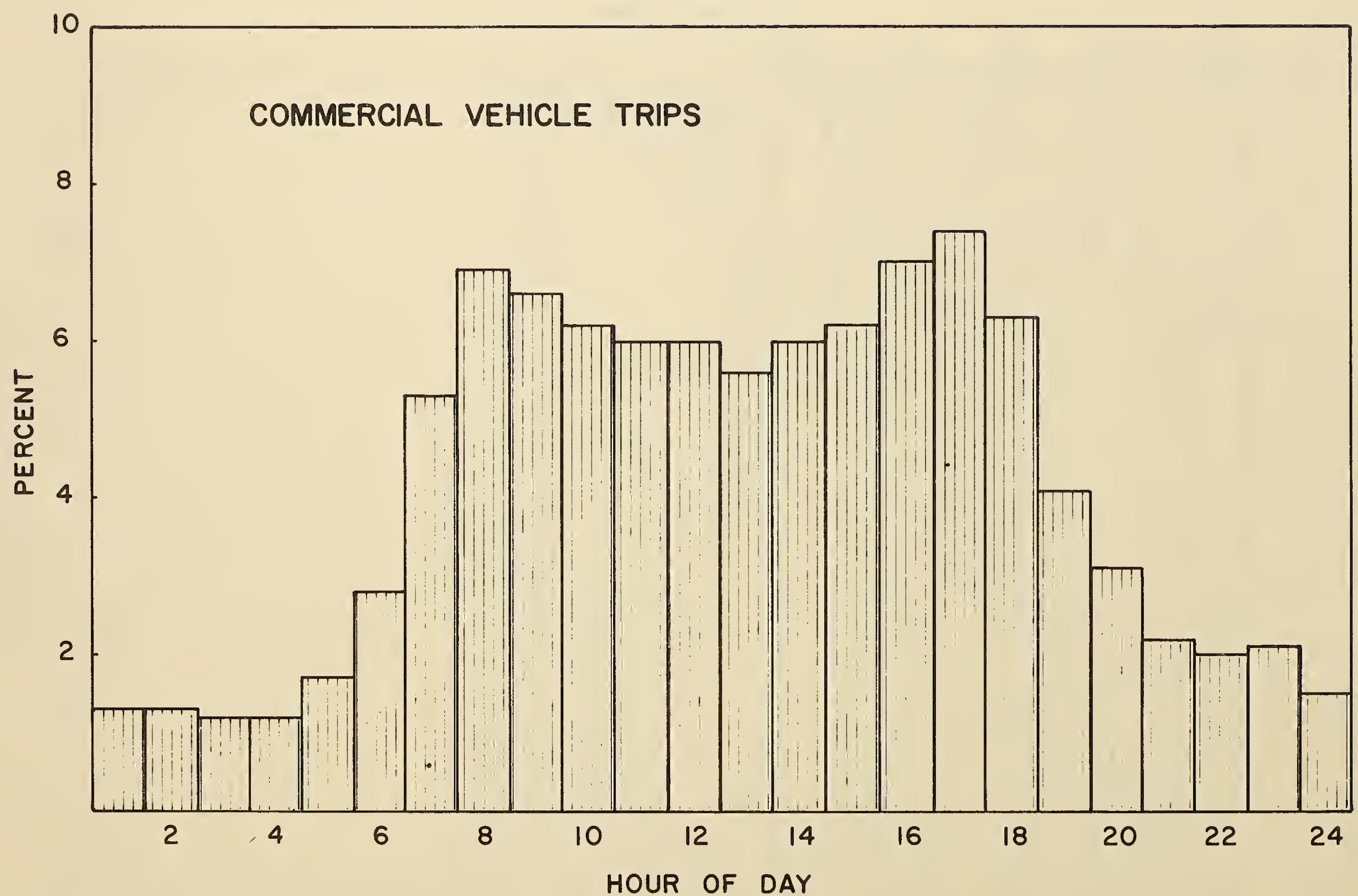


Figure 10. Commercial trips

The 24-hour distribution totals unity for each trip purpose and direction.

Switch = 2 - Percent of Total Volume by Trip Purpose

The array PERCNT is initialized by direction and for the initial and final analysis year with the percentage distribution of total volume (ADT) falling in each of the following trip purposes:

1. Work
2. Personal business
3. Social-recreational
4. School
5. Vacation
6. Commercial

The initialization defaults are shown in Table 6. The program user, at his option, can override the percentage distribution by direction and analysis level (initial or final year).

Switch = 3 - Directional balancing switch

This switch causes the hourly distribution of traffic by direction to be balanced so that the distribution is identical in both the AM peak and the PM peak directions.

Switch = 4 - Permitted occupancy interval by activity

The array INOCC is initialized with values defining when the roadway may be occupied to perform each activity as shown in Table 6. The array variable is dimensioned as follows:

INOCC (10,3) - Column one holds up to ten descriptors. The 10th position is reserved for the default option, therefore, the user may enter a maximum of nine descriptors. The three switches associated with each descriptor are the following:

Table 6 . Program default matrix of trip purpose distribution.

Trip	Initial Year		Final Year	
Purpose	A.M. Peak	P.M. Peak	A.M. Peak	P.M. Peak
Work	33.1%	33.1%	33.1%	33.1%
Social-recreational	18.9%	18.9%	18.9%	18.9%
Personal business	28.4%	28.4%	28.4%	28.4%
Vacation	0.1%	0.1%	0.1%	0.1%
School	9.5%	9.5%	9.5%	9.5%
Commercial	10.0%	10.0%	10.0%	10.0%

1 = Activity number

2 = Occupancy starting hour

3 = Occupancy terminal hour

Activity number 10 is a dummy number which can be assigned to Switch No. 1 when the start and terminal hour are to be associated with all activities. The default is a dummy activity number 10. Should the program user elect to define a period applicable to all activities, the default is overridden. Otherwise, the default is supplemented by the user-supplied descriptors. The default occupancy interval is only used when an occupancy interval for a given activity is not made available to the program.

Switch = 5 - A range of override parameters by activity which are held in the array OVER.

The default values for this array are shown in Table 7 . The program user at his option can override any one of these defaults by activity. Included in OVER are the variables which are identified by the following switches:

1 = The number of continuous hours that a crew is permitted to work

2 = The maximum distance in feet between worksite locations. This defines joint spacing, the maximum size of a patch, etc.

3 = A workload model factor which is used to multiply the value created by the workload models in the routine AWORKL. As example, if the model predicts 10 units and the workload model factor is 3, then the workload becomes 30 (3 x 10).

4 = A workload model fixed annual rate which when input, is substituted for any computed workload value in the routine AWORKL.

Table 7. The program default values assigned to override variable OVER(N,IA)

Switch No.	Switch Description	Activities Code Number(IA) 1	2	3	4	5	6	7
1	Allowed continuous crew hours	9.00	8.00	8.00	8.00	8.00	8.00	12.00
2	Work location spacing	50.00	50.00	50.00	50.00	50.00	50.00	50.00
3	Workload model factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00
4	Workload override	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	Travel time in hours	0.50	0.50	0.50	0.50	0.50	0.50	0.50
6	Maintenance level	1.00	1.00	1.00	0.20	1.00	1.00	0.0
7	Cure time in hours	3.00	1.00	1.00	1.00	1.00	1.00	0.0
8	Traffic control hours	0.25	0.25	0.25	0.25	0.25	0.25	0.25
9	Maximum zone length in miles	0.50	0.50	0.50	2.00	0.50	0.50	1.00
10	Allowable volume capacity ratio	1.00	1.00	10.00	1.00	1.00	1.00	10.00
11	Minimum zone length in miles	0.10	0.10	0.10	0.10	0.10	0.10	0.25
12	Shoulders open to traffic	0.0	0.0	2.00	0.0	0.0	0.0	0.0

This permits the user to bypass the workload models built into the program.

5 = Travel time, which is the time in hours, required by a crew to go from a garage facility to the freeway and then return to the garage facility at the end of the work period or day.

6 = The maintenance level which determines the frequency of performing an activity. This is a key parameter, and if an activity is to be deleted, the maintenance level should be specified as zero. The program bypasses all processing any time an activity with a zero occurs in the program iteration process. A maintenance level value of 1 causes the annual workload to be processed once during the year. A maintenance level value of 2 causes the annual workload to be divided into two equal parts and the economic analysis reflects the costs to occupy the roadway at two occupancy intervals. A maintenance level value of .2 will cause the program to accumulate annual workload until the maintenance level accumulates to a value above 1. In this case, the activity would be executed once every five years and the workload will be five times the annual workload.

7 = The cure time in hours required for an activity. Where this value is specified, it reflects time which the roadway is occupied during each occupancy when no productive work can be done.

8 = The time in hours required to install traffic control signing and delineation. This is time which precedes the start of

productive activity. It should reflect the mean time which can be used for either the installation or removal of traffic control.

9 = The maximum length permitted for a traffic control zone. This governs the frequency of traffic control installations in the roadway occupancy simulation process which occurs in subroutine MAINT.

10 = The volume/capacity ratio allowed. This value is tested against the V/C ratio computed for each hour of proposed occupancy. If this value is exceeded, the roadway cannot be occupied during that hour by maintenance crews.

11 = The minimum work zone distance in feet. This specifies the length of the worksite required when crews occupy the roadway to perform work at a single worksite location. This is the area occupied by crew and equipment. It should not include the taper distance used for traffic merging prior to reaching the worksite or leaving the worksite.

12 = The number of shoulders open to traffic.

Switch = 6 - Vertical and Horizontal Alignment

The array ALIGN is initialized with zeroes, a default reflecting a roadway which is a normal tangent section. The program user, at his option, can specify vertical and horizontal alignment. This is used in the determination of the vehicle operation cost array in routine OPCOST which resides in subroutine OPPARA.

Switch = 7 - Vehicle Classification Data

The array WEIGHT is initialized with the default values shown in Table 8. The user has the option of overriding these default values.

Table 8 . Program default values for vehicle classification variable WEIGHT (N,I)

Vehicle number N	1. Vehicle weight class in kips	2. Percentage of vehicles in weight class	3. Sales price associated with weight class
1	4.2	93.1	$ 3000
2	15.4	2.9	7300
3	39.8	2.2	24400
4	53.6	2.8	39300

If this option is used, the entire array must be entered, and the first class must be a description of passenger cars. Up to nine different commercial vehicle classes may be defined.

Switch = 8 - Maintenance Simulation Parameters

The array SIM is based on pavement type and the default is obtained from array SSIM, as shown in Table 9.

The user, at his option, may override the simulation parameters for any activity. The simulation parameters described in SIM are the following:

A. Type of worksite switch
   1 = Full size patch
   2 = Partial size patch
   3 = Lanes

B. Worksite factor

C. Worksite add-on

D. Simulation iterations

E. Spacing parameter switch
   1 = Random
   2 = Uniform

Switch = 9 - Unit Operating Cost

The arrays FUEL, TIRES, OIL and variable SINDEX are initialized for passenger cars and composite commercial vehicles in BLOCK DATA. The default values are shown in Table 10. The user has the option of overriding any one of these unit cost arrays or the variable SINDEX. The array unit costs are used in converting fuel consumption, tire wear and oil consumption to cost. The variable SINDEX is used to modify the vehicle maintenance costs which are based on 1963 dollars.

Switch = 10 - Print Switch

The variable IPRINT is initialized with the value 1 which produces

Table 9 . Program default matrix used in the initialization of the simulation matrix

Activity No.	Worksite Type	Worksite Multiplier	Worksite Add-on	Iterations	Spacing Type
		Portland Cement Concrete			
1	Full Depth	1	0	100	Random
2	Partial Depth	1	0	100	Random
3	Full Depth	0	1	1	Random
4	Lanes	12	0	250	Uniform
5	Partial Depth	3	10	100	Random
6	Full Depth	10	0	100	Random
7	Lanes	1500	0	10	Random
		Bituminous Concrete			
1	Full Depth	1	0	100	Random
2	Lanes	12	0	250	Random
3	Full Depth	1	0	100	Random
4	Lanes	0	0	1	Random
5	Lanes	0	0	1	Random
6	Lanes	0	0	1	Random
7	Lanes	1500	0	10	Random
		Composite Pavement			
1	Full Depth	10	0	100	Random
2	Lanes	0	0	1	Random
3	Full Depth	0	1	1	Random
4	Lanes	12	0	250	Uniform
5	Partial Depth	3	10	100	Random
6	Lanes	0	0	1	Random
7	Lanes	1500	0	10	Random

Table 10. Program default values for vehicle consumption parameters

Consumption Parameter	Passenger Cars	Commercial Vehicles
Fuel($/Gallon)	0.40	0.30
Oil	0.80	0.40
Tires($/.001 inches)	0.10	0.20
Maintenance Index	1.5	1.5

maximum program output printing. The user can restrict printing by overriding this variable. The options are as follows:

1 = Direction, Years, Year Total, Total

2 = Years, Year Total, Total

3 = Year Total, Total

4 = Total

The variable JPRINT is initialized with 1. This causes all input, scalar and array assumption values used in the program to be printed. A value of 2 supresses this print.

Switch = 11 - Pavement Lane Width

The variable WIDTH is initialized at 12 feet. It can be overridden by the user.

Switch = 12 - Income Level

The variable INC is initialized as 4 and is used in routine VTIME which creates the value of time array. It can be overridden by the user.

Switch = 13 - Speeds for Walking and Traveling on Roadway

The variables WALK and TCMOVE are initialized at 2 mph and 20 mph. These are used in the subroutine MAINT during the simulation of roadway occupancy. They can together be overridden by the user.

Switch = 14 - Terminal PSI Value

The variable PSIRS is initialized at 2.0. This is used in the routine AWORKL to determine resurfacing requirements. The resurfacing requirement also can be triggered by the pavement systems program that this program "EAROMAR" was designed to support. The user has the option to change PSIRS.

Switch = 15 - Detour Parameters

The variable DETOUR is initialized with the default values shown in Table 11. The user can specify through optional inputs a completely new set of detour descriptors. The detour condition occurs in the program anytime all lanes are closed and no shoulders are available. The variables included in detour are the following:

1 = The distance between freeway interchanges which is used to evaluate normal motorist operation conditions

2 = The detour length which is the influence zone for the freeway traffic when a detour is used

3 = Detour speed limit which is needed in the development of a speed matrix for operation on the detour

4 = Detour volume which must be added to the freeway volume before an analysis of the operation on the detour can be made

5 = Detour capacity which influences the speed matrix determined for the detour and the operation on the detour

6 = Average composite stop cycles on the detour used in determining speed change cost for operation on the detour

7 = Direction lanes on the detour needed to convert capacity to lane capacity in the determination of the speed matrix

Switch = 16 - Design Life

Two design life values which can be overridden are used in the program. The variable DLIFE specify the design life of the initial pavement. The variable RLIFE specifies the design life of a resurfaced pavement. The design life controls resurfacing cycles when not overridden by a pavement systems override. The default value assigned in the program are 20 years for DLIFE and 10 years for RLIFE.

Table 11. Program default values used in variable DETOUR(7)

Subscript	Description	Value	Units
1	Interchange Spacing	2.00	Miles
2	Detour Length	2.60	Miles
3	Speed Limit	45.00	MPH
4	Traffic Volume	20000	ADT
5	Capacity	2400	Vehicles
6	Average Stops all Vehicles	.80	Stops
7	Number of Directional Lanes	2	Lanes

Switch = 17 - Activity Standards

The activity standards are used in the evaluation of the cost of maintenance and in the determination of roadway occupancy time. The variable has three components for each activity. These are as follows:

1 = Labor and equipment cost per hour of crew operation

2 = Material costs per activity workload unit

3 = The productivity of the crew in performing the activity in terms of workload units per hour.

Switch = 18 - Capacities

The array CAP is based on freeway type and the defaults are obtained from array CCAP.

The user at his option may override the capacity values for a given freeway type. The subscripts used in defining the closure category applicable varies with the freeway type. On an eight lane freeway the following categories are applicable:

1 - CAP(1) = One lane closed

2 - CAP(2) = Two lanes closed

3 - CAP(3) = Three lanes closed

4 - CAP(4) = Shoulder

5 - CAP(5) = Freeway

Switch = 19 - Freeway Design Speed

The variable DSPEED is initialized at 70 mph. It is used in the routine SPEED which resides in subroutine INITAL as part of the algorithm generating a speed matrix which is used in the development of motorist impacts in subroutine MOTOR. It can be overridden by the user.

Switch = 20 - Average Accident Cost

The variable AACOST is initialized with 850 dollars and can be overridden by the user. It is used in subroutine MOTOR to factor accidents to accident costs.

Switch = 21 - Vehicle Occupancy

The variables OCWORK, work trip vehicle occupant and OCSCHL, school trip vehicle occupant, are initialized with 1.4 and 2.5 respectively. The user can override these variables which are used in the evaluation of the value of time for work trips and school trips.

Switch = 22 - Commercial Value of Time

The variable COMVOT is initialized with $8.50 per hour and is used in evaluating the loss time for commercial vehicles. The user can override this variable.

Switch = 23 - Speed Limit

The array SLIMIT, which can be overridden by the user, is assigned default values and has the same subscript constraints relating to closure category applicable to capacity. For a six-lane freeway, these are as follows:

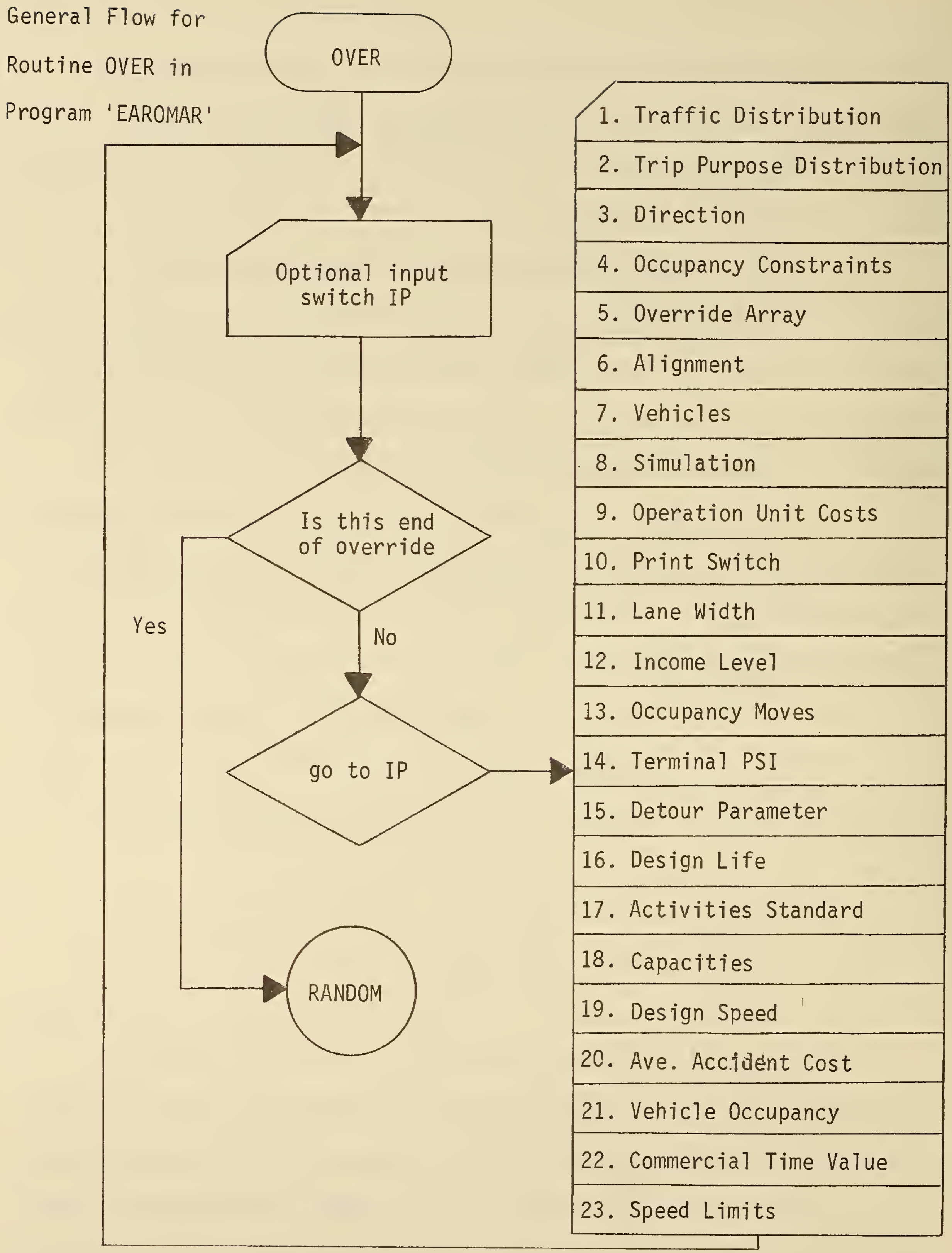
1 - SLIMIT(1) = One lane closed

2 - SLIMIT(2) = Two lanes closed

3 - SLIMIT(3) = Detour

4 - SLIMIT(4) = Freeway

The defaults used in the program apply to 8-lane freeways and in the data initialization statement, SLIMIT(1-5) is assigned 60 mph. In the program, the speed limit assigned to a detour is reassigned to the directional lane position for the variable, i.e., SLIMIT(LANES) = DETOUR(3). For a six-lane freeway, LANES = 3. If DETOUR(3) = 35 mph, then SLIMIT(3) = 35 mph.


General Flow for
Routine OVER in
Program 'EAROMAR'
OVER
Optional input switch IP
Is this end of override
Yes
No
go to IP
RANDOM
1. Traffic Distribution
2. Trip Purpose Distribution
3. Direction
4. Occupancy Constraints
5. Override Array
6. Alignment
7. Vehicles
8. Simulation
9. Operation Unit Costs
10. Print Switch
11. Lane Width
12. Income Level
13. Occupancy Moves
14. Terminal PSI
15. Detour Parameter
16. Design Life
17. Activities Standard
18. Capacities
19. Design Speed
20. Ave. Accident Cost
21. Vehicle Occupancy
22. Commercial Time Value
23. Speed Limits

SUBROUTINE INITAL

ROUTINE: RANDOM

Purpose

This subroutine creates four arrays needed for the simulation of roadway occupancy by maintenance crews in the subroutine MAINT. The four arrays are as follows:

1. PATCHF, 1000 random size PCC or bituminous patches
2. PATCHP, 1000 random size partial depth PCC patches
3. RLOC, 1000 random numbers in ascending order from 0 to 1
4. SWORK, the simulation workload for each of seven activities

Description

To execute this routine, the pavement type, pavement lane width, spacing between worksites, and the array SIM are needed. The routine is executed one time for any analysis period.

The routine generates pairs of random numbers (X,Y) based on an initial odd seed number of 7. The first random number is multiplied by the distance between concrete patches specified to the program (distance between worksites). For partial depth patches, the random number is multiplied by a maximum area of 40 square feet. The length or area thus determined is substituted into a density function and the predicted value compared with the second random number to determine if it falls under either of the density function curves.

The first density function describes the distribution of full depth portland cement concrete patch lengths and is as follows:

$$F(y) = .000179((.75X)^8 e^{-.75X})$$

The second density function describes the distribution of partial depth portland cement patch size areas and is as follows:

$$F(y) = 2.2(.75X)^{1.5}(e^{-.75X}) + .1$$

Each time a random pair of numbers is accepted for the full depth patch it is factored and placed in the array PATCHF. For portland cement concrete pavement, the factor is the pavement lane width thereby producing a patch in square yards which averages four yards long and the width of a pavement lane. For the bituminous pavement, the length is factored by ten producing an average patch in square yards which is 40 yards long and the width of the pavement lane. The partial depth patches are placed directly in the array PATCHP as they are acceptable.

The process is iterated until 1000 full size and 1000 partial depth patches have been established.

A random number is placed in the array RLOC during the first 1000 iterations of the process. Following the completion of the iteration process, the 1000 random numbers in the array RLOC are sorted in ascending order.

Finally, the routine establishes the magnitude of the lane mile workload which will be used in the simulation subroutine MAINT for each activity. The array SIM has the five following descriptors for each activity:

A. Type of worksite switch is either
   1. Full size patch
   2. Partial size patch
   3. Lanes

B. Worksite Factor

C. Worksite Add on

D. Simulation iterations

E. Spacing parameter switch
   1. Random
   2. Uniform

The worksite switch determines how the simulation workload is established.

The three possibilities are as follows:

Where

A_1 = Full size patch size

A_2 = Partial depth patch size

A_3 = Number of lanes closed

B = Worksite size multiplier

C = Worksite size add on

D = Number of simulation iterations

SW = Simulation Workload

Switch = 1

$$SW = \sum_{i=1}^{i=D} (A_{1(i)} \times B+C)$$

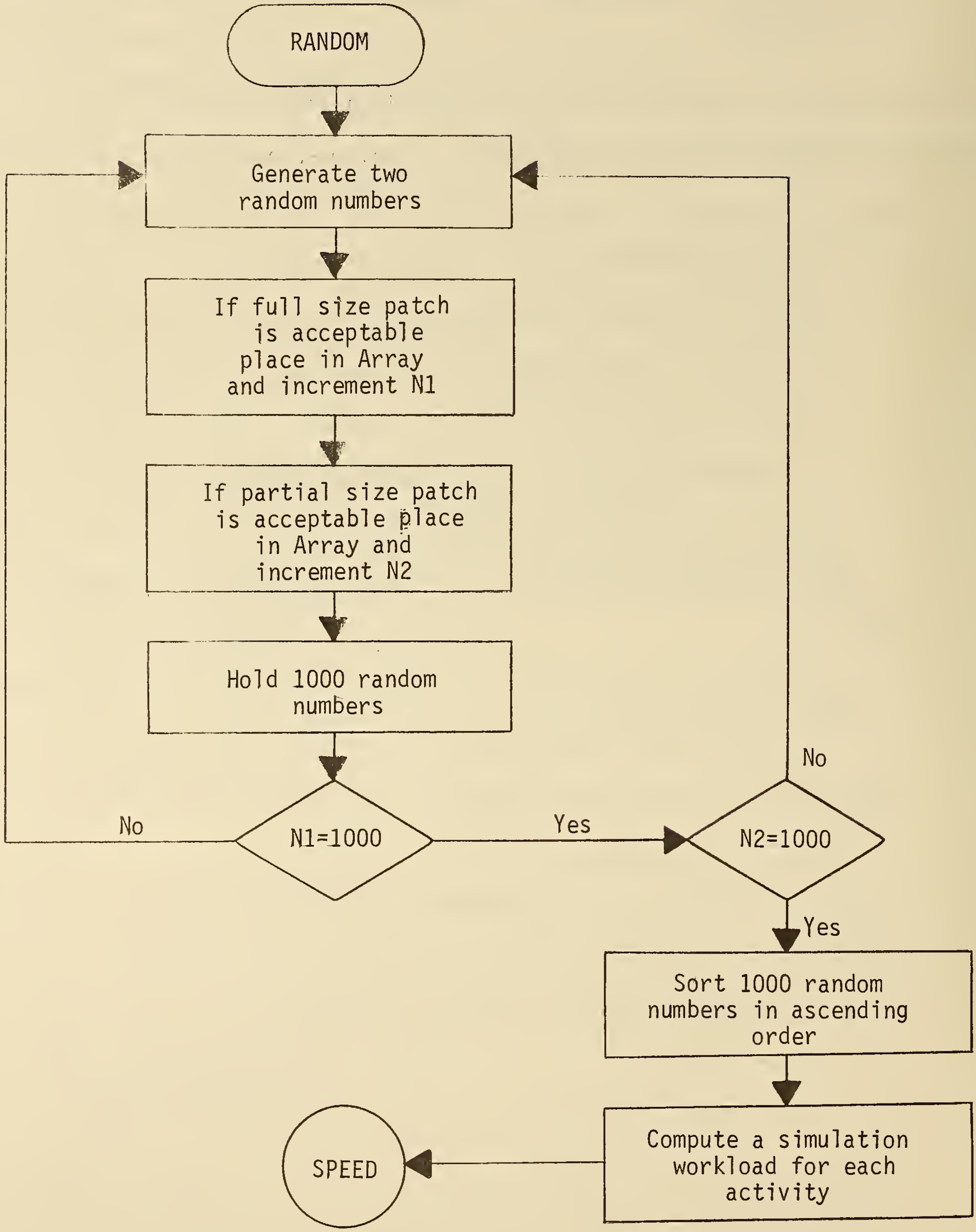
Switch = 2

$$SW = \sum_{i=1}^{i=D} (A_{2(i)} \times B+C)$$

Switch = 3

$$SW = (A_3 \times B+C) \times D$$

General Flow for Routine RANDOM in Program 'EAROMAR'



SUBROUTINE INITAL

ROUTINE: SPEED

This routine creates the array SP which identifies to the subroutine MOTOR the speed to associate with a computed volume-capacity ratio for the freeway, a lane closure, or a detour.

Description

The execution of this routine requires the freeway design speed and the speed limit and hourly capacity for the freeway, each lane closure and the detour.

The lane capacity is determined in the program by dividing the assigned capacity by available lanes.

The following algorithm is used to establish a speed matrix for the freeway, detour and each lane closure category:

Given

DS = Freeway Design Speed

SL = Category Speed Limit

C = Category Capacity (1000's)

L = Lanes open to motorist

V_i = A volume in 1000's

Find S = Speed in miles per hour for a given v/c ratio

1. $S1 = .9DS$

2. $S2 = 12C + .5C^{4.46}$

3. $S3 = S1 - S2$

4. $S4 = (.4V - 10)(V/C)$

5. $S5 = S3 - S4, S5 \geq 0$

6. $S6 = (V/C)^{25}(S5)$

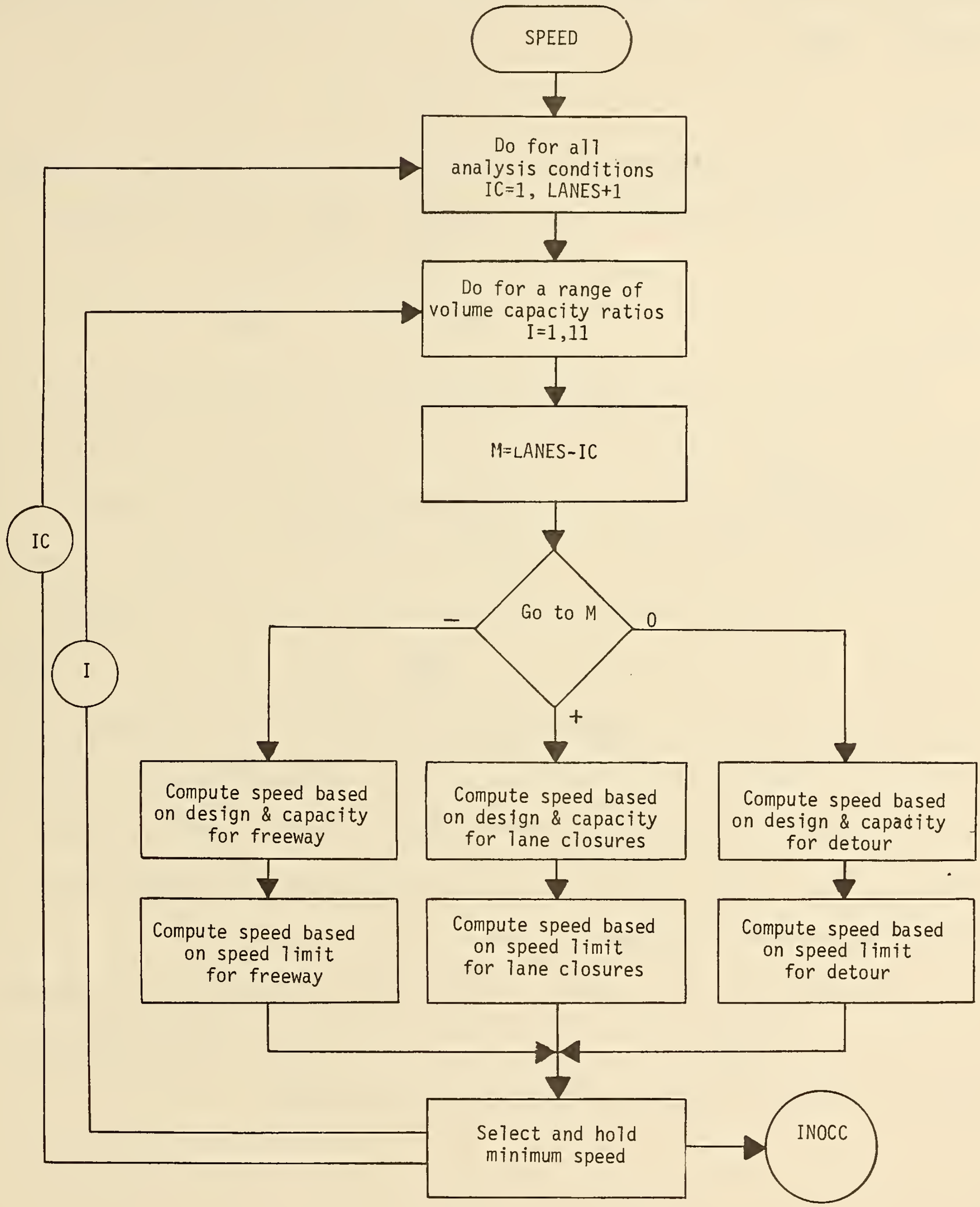
7. $S_d = S1 - S4 - S6$

8. $S_1 = SL \times .9 - 3.6\ V/C$

9. $S = \text{MINIMUM}\ (S_d, S_1)$

This algorithm is iterated through eleven uniform increments of the volume-capacity ratios starting at zero and going to 1.

General Flow for Routine SPEED in Program 'EAROMAR'



SUBROUTINE INITAL

ROUTINE: INOCC

Purpose

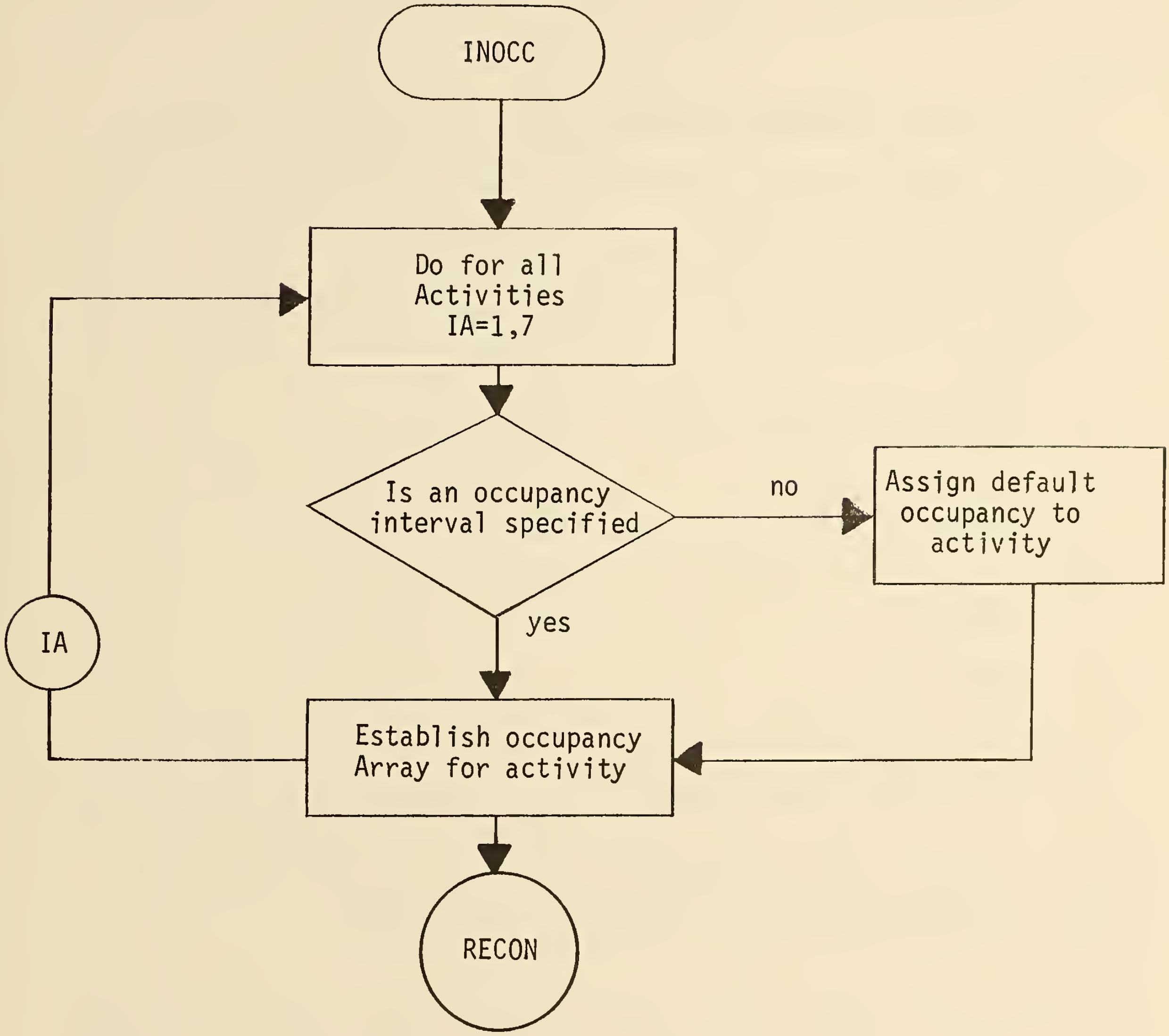
This routine creates the array IHOUR which identifies to the routine AVAIL in subroutine MAINT the hours when the roadway can be occupied by work crews.

Description

The execution of this routine requires the array INOCC which establishes the roadway occupying starting hour and finishing hour interval for each activity. Each activity is addressed in turn and the array INOCC examined to determine if a starting hour and finishing hour interval has been specified for the activity. When no activity is present, the default interval associated with activity number ten are used. The array IHOUR has been initialized with zeroes. Each hour of occupancy permitted for each activity is valued as unity (1) in the array. Therefore the resulting array has associated with each of 24 hours for each activity either a zero or a one. The crew can occupy the roadway only during the hours having a one.

A 24 hour occupancy interval is established by assigning the variable for crew hours (OVER(12,IA)) a value of 24. This causes the IHOUR array to have 1's placed in each of the array's 24 positions.

General Flow for Routine INOCC in Program 'EAROMAR'



SUBROUTINE INITAL

ROUTINE: RECON

Purpose

This routine establishes a traffic array which is used throughout the program "EAROMAR". The traffic array consists of a base year and yearly add-on increment which describes the hourly distribution of freeway traffic by direction for the following seven trip purposes:

1. Work
2. Personal business
3. Social-recreational
4. School
5. Vacation
6. Commercial
7. All traffic

In this routine, the initial and final volumes, the percentage of commercial vehicles, and the A.M. peak direction splits also are converted to base year and yearly increment, respectively.

Description

The execution of this program requires the arrays PCTADT and PERCNT as initialized or overridden by the program user in routine OVER. Regardless of the percentage of commercial volume reflected by the array PERCNT, it is replaced by the required input variable TRUCKS which defines percent commercial. This reconciliation is achieved by forcing all passenger car trips to equal the difference between the percentage in

TRUCKS and 100 percent. The ratio of the new passenger portion to the original passenger portion creates a factor which is applied to the passenger trip purposes in the array PCTADT.

The routine tests to determine if the program user has overridden any portion of the array PCTADT. Each user overridden portion identified is checked and reconciled to 100%. Each of the individual trip purpose 100% distributions in the array PCTADT is factored by the appropriate percentage in the array PERCNT. If the "all traffic" portion of the array PCTADT is input, then all trip purposes are reconciled to the "all traffic" value for each hour.

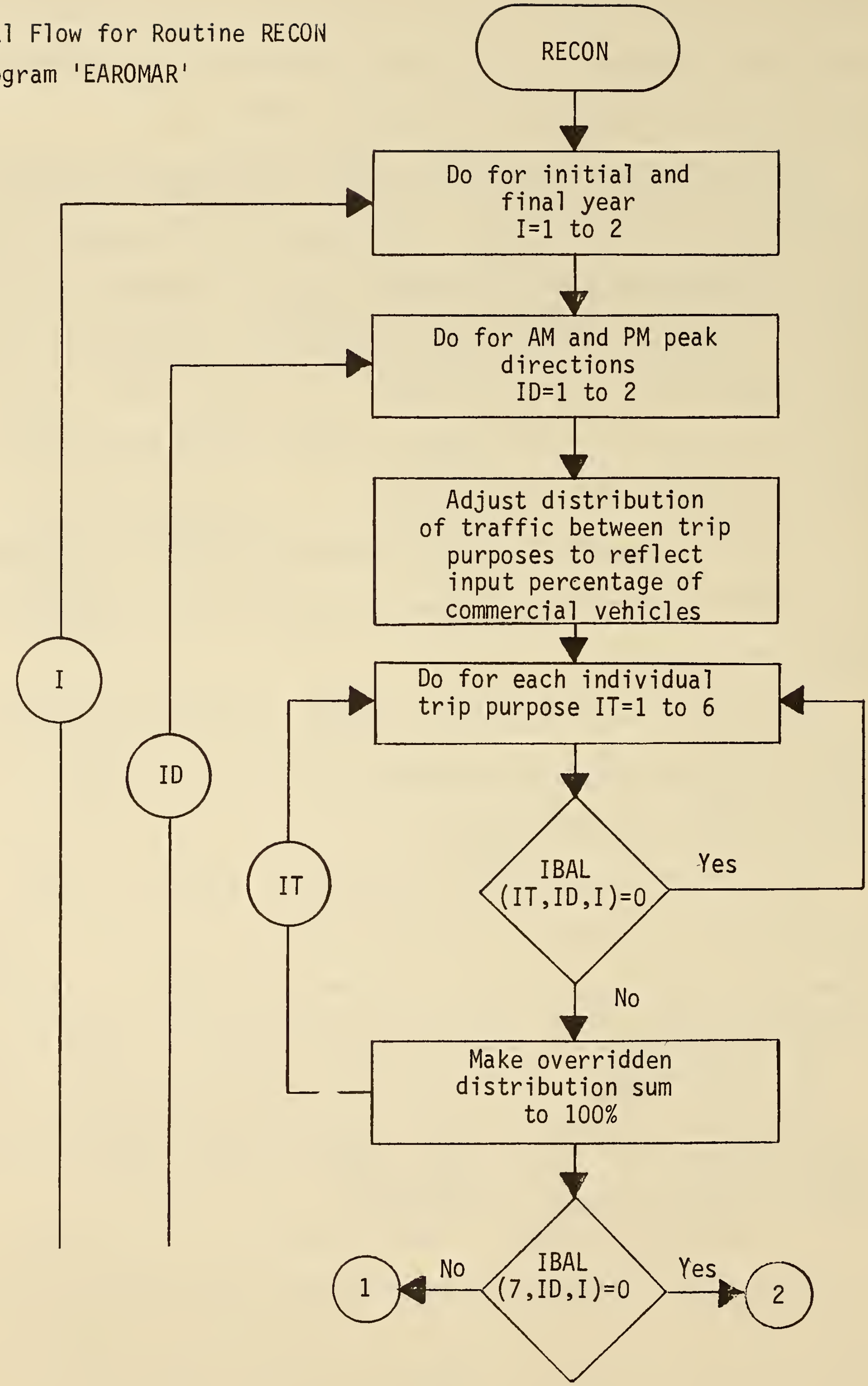
If the "all traffic" portion of the array PCTADT is not input, this portion is created by summing the individual trip purpose distributions for each hour.

When the directional balancing switch is specified in routine OVER by setting IDIR=3, the distributions for both directions are replaced by the average distribution.

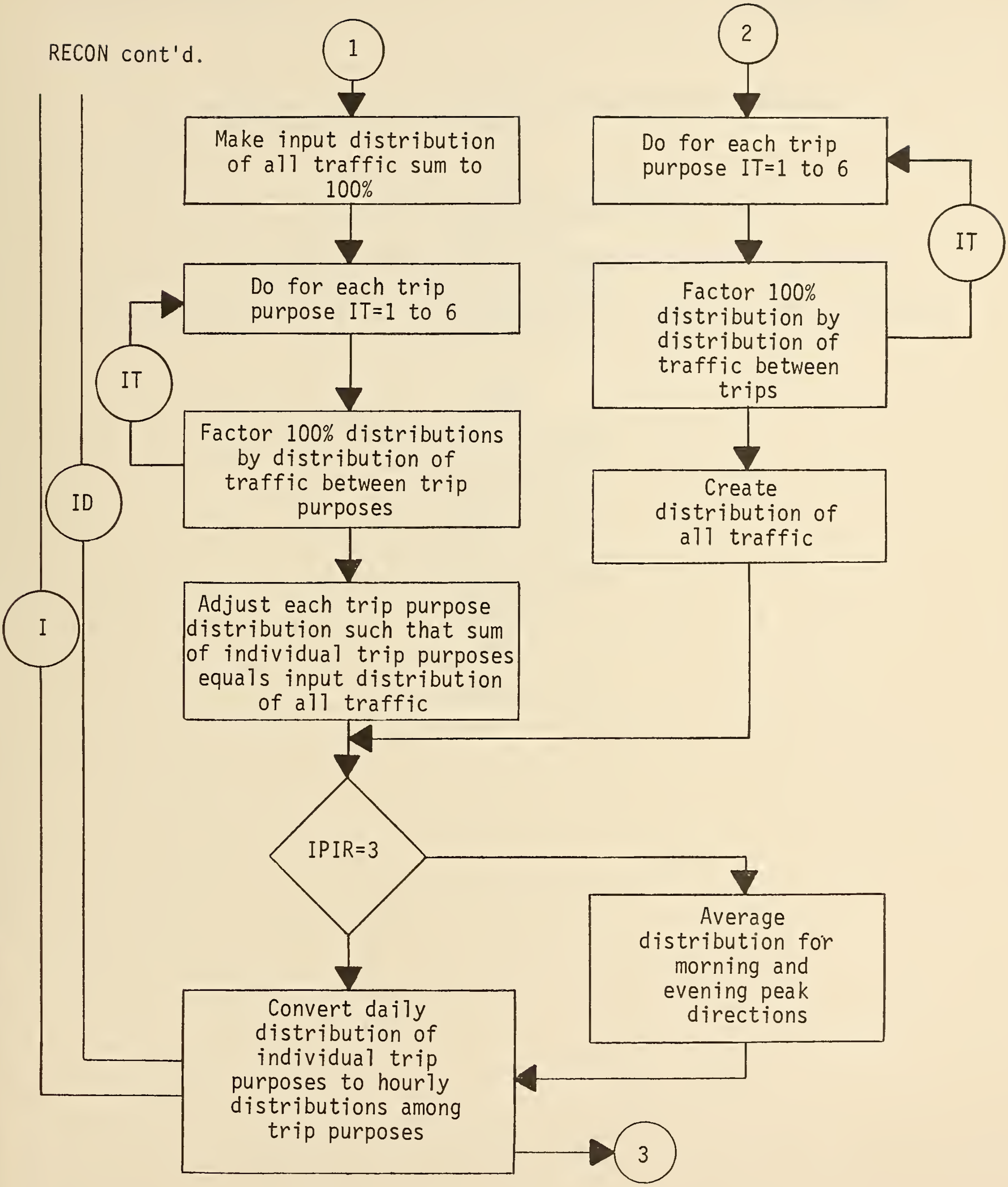
Once the hourly distributions for both directions have been created, the individual trip purpose distribution portion of the array PCTADT is converted to hourly distributions between the different trip purposes. The daily distribution of traffic is held in the "all traffic" portion.

The final step of this routine is to convert the initial and final year portions of the arrays PCTADT, VOLUME, TRUCKS, and SPLIT to base year and yearly increment, respectively.

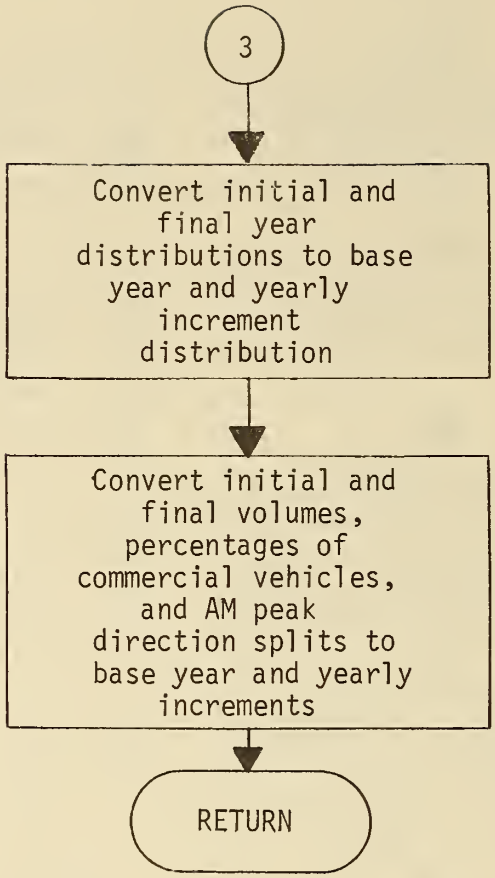
General Flow for Routine RECON
in Program 'EAROMAR'



RECON cont'd.


1
2
Make input distribution of all traffic sum to 100%
Do for each trip purpose IT=1 to 6
IT
Factor 100% distributions by distribution of traffic between trip purposes
ID
I
Adjust each trip purpose distribution such that sum of individual trip purposes equals input distribution of all traffic
Do for each trip purpose IT=1 to 6
IT
Factor 100% distribution by distribution of traffic between trips
Create distribution of all traffic
IPIR=3
Average distribution for morning and evening peak directions
Convert daily distribution of individual trip purposes to hourly distributions among trip purposes
3

RECON cont'd.


3
Convert initial and final year distributions to base year and yearly increment distribution
Convert initial and final volumes, percentages of commercial vehicles, and AM peak direction splits to base year and yearly increments
RETURN

SUBROUTINE OPPARA

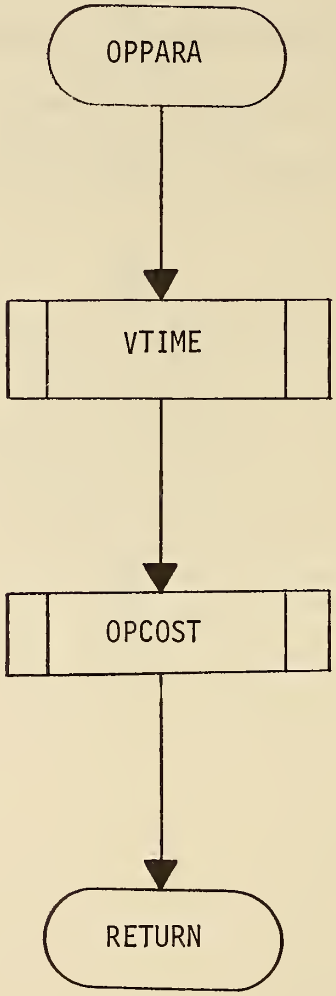
Purpose

This subroutine contains the two routines VTIME and OPCOST.

Description

The routines are combined to reduce overlay requirements. The routine VTIME generates a value of time matrix and OPCOST generates a vehicle operation cost matrix. Both are described in detail elsewhere.

General Flow for Subroutine OPPARA in Program 'EAROMAR'



SUBROUTINE OPPARA

ROUTINE: VTIME

Purpose

This routine establishes an array, VTRATE, which is used in routine TIME of subroutine MOTOR. This array contains the hourly values of time loss from 1 to 40 minutes for the following five passenger car trip purposes:

1. Work
2. Personal business
3. Social-recreational
4. School
5. Vacation

Description

The execution of this program requires the initialization of the average income level of a motorist, INC, with any one of the following switches:

1. Under $3999/yr.
2. $4000-5,999/yr.
3. $6000-7,999/yr.
4. $8000-9,999/yr.
5. $10,000-11,999/yr.
6. $12,000-14,999/yr.
7. $15,000-19,999/yr.
8. Over $20,000/yr.

The values of time between five and fourteen minutes are valued using the following equations:

$$BEN = b_0 + b_1\Delta t + b_2 I\Delta t$$

$$PO = 1.0/(1.0 + EXP(A_c \times BEN))$$

$$BAVG = (1.0 - PO) \times (BEN + Ln(^{(1+PO)}/(1-PO))/A_c$$

Where

b_0, b_1, b_2 and A_c are constants

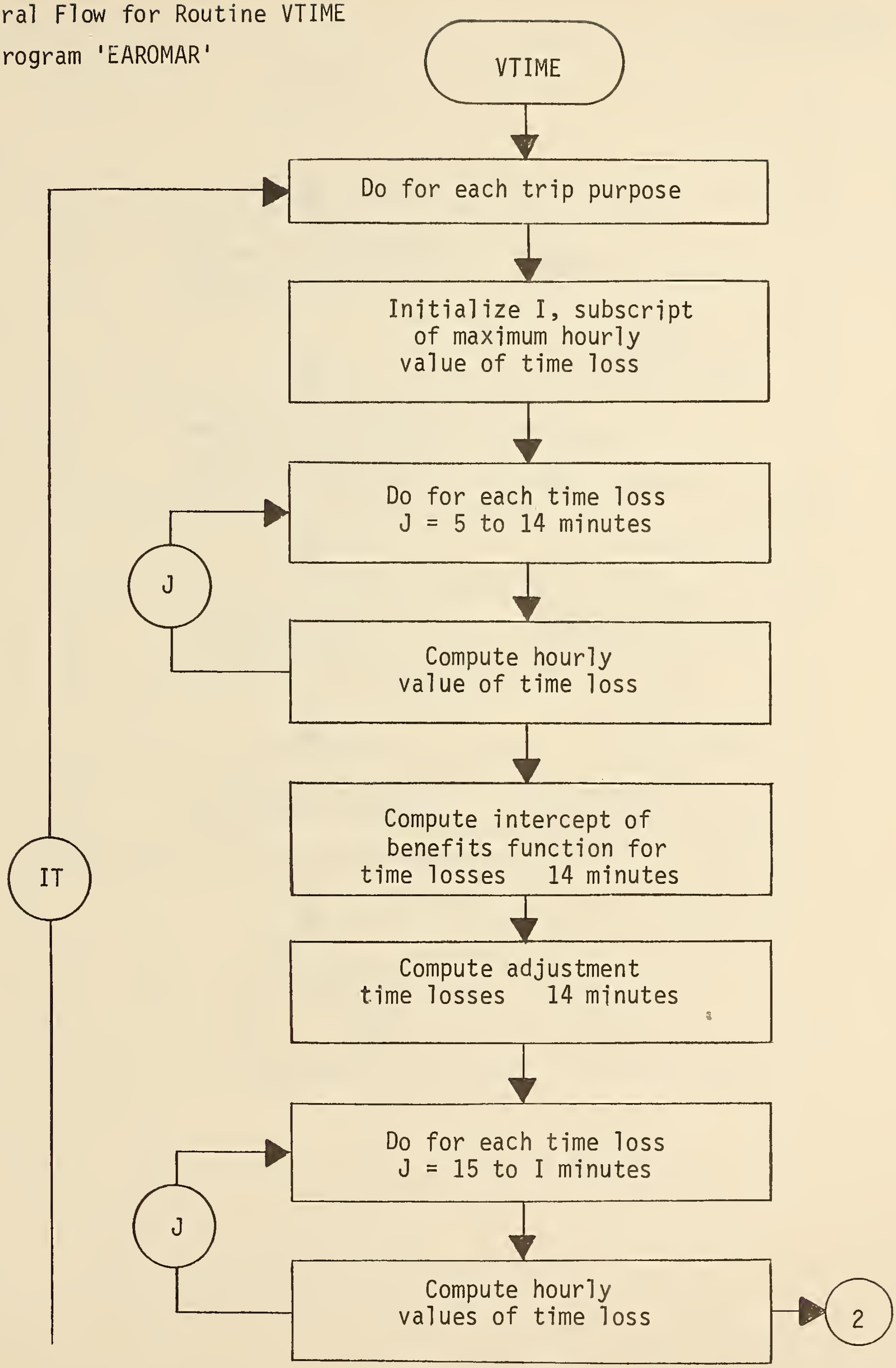
for each trip purpose for the time intervals ($5 \leqslant \Delta t \leqslant 15$ and $\Delta t \geqslant 15$)

BEN - is the benefit of the 50th percentile motorist

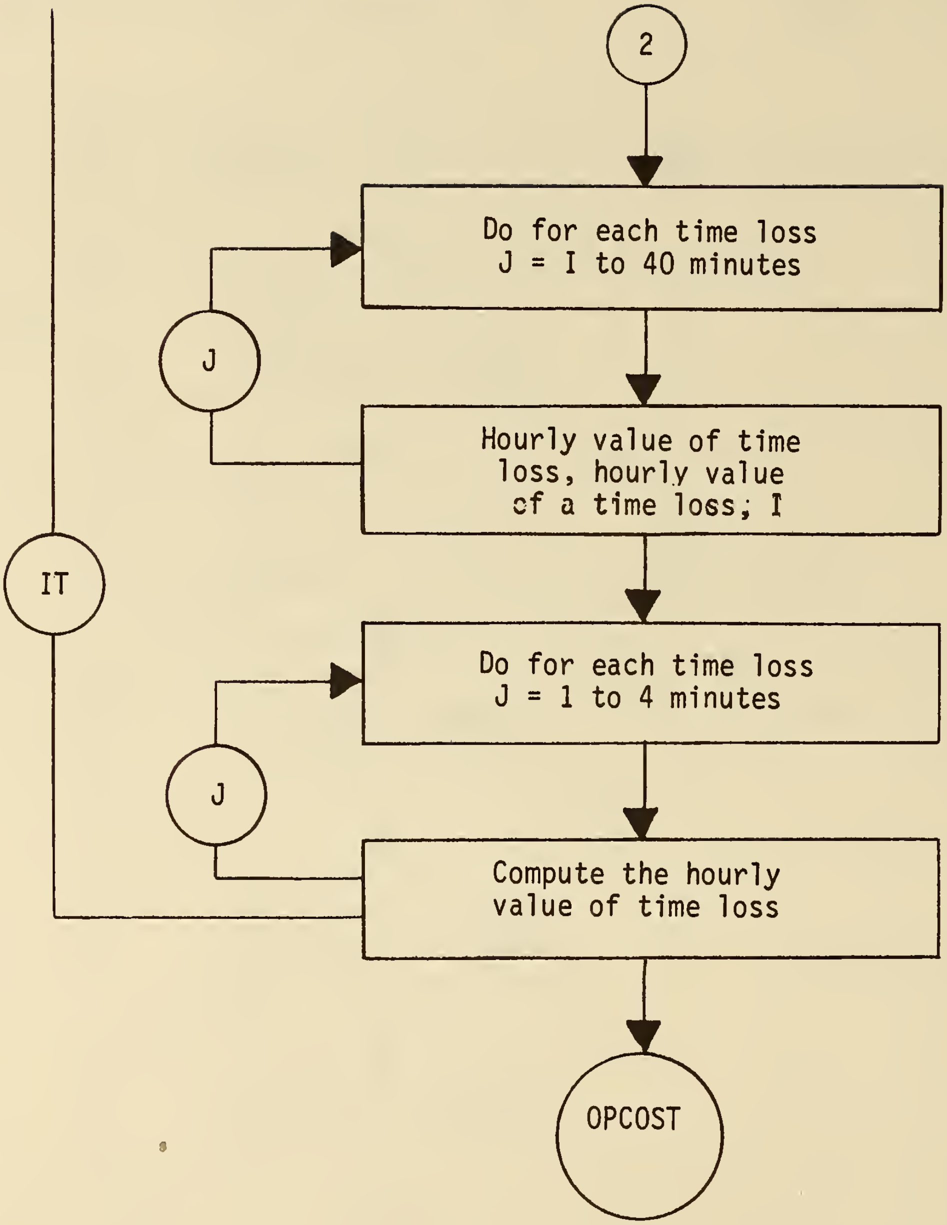
PO - is the probability of a motorist having zero benefits

BAVG - is the average benefit of all motorists in cents

General Flow for Routine VTIME
in Program 'EAROMAR'



VTIME cont'd.


2
Do for each time loss
J = I to 40 minutes
J
Hourly value of time
loss, hourly value
of a time loss; I
IT
Do for each time loss
J = 1 to 4 minutes
J
Compute the hourly
value of time loss
OPCOST

SUBROUTINE OPPARA

ROUTINE: OPCOST

Purpose

This routine creates the operation cost array OCOSTS to be used in the subroutine MOTOR in costing motorist operation cost.

Description

The execution of the routine requires the roadway alignment array ALIGN and the vehicle description array WEIGHT.

The routine makes use of a series of models which predict fuel consumption, tire wear, oil consumption, vehicle maintenance, and depreciation as a function of vehicle operational speed and roadway alignment for a base weight passenger vehicle. These consumption parameters are placed in the array OCOST.

A second series of models factors the base vehicle operation parameters to reflect the vehicles described in the vehicle description array WEIGHT. Then the unit costs arrays FUEL, TIRES, OIL and SENDEX are used to convert the consumption units developed in these models to cost.

The array OCOSTS which is created has operation costs for unity speeds 1 through 65 for passenger cars and for a single composite commercial vehicle.

The models used in this routine are the following where

A = model intercept

B = model coefficient or variable

C = model coefficient or variable

S = speed

FS = float speed

G = grade in percent

H = curvature in degrees

W = vehicle weight in kips

RW = vehicle weight factor

CP = consumption quantity per vehicle hour

U = unit cost

OCOST ( ) = operational costs

Fuel Consumption in Gallons per Hour

Positive Grade

$A = -.45 + .0278(S)$

$B = .0348 + .0214(Ln(S))$

$CP = e^{(A + BG)}$

Negative Grade

$FS = 3 + 7G$

$A = e^{(-.4844 + .0285(S))}$

$B = e^{(-.4884 + .0285(FS))}$

$C = 1/(1.61 + .1(S))$

$CP = C \text{ where } S < FS$

$CP = A - B + C \text{ where } S > FS$

Curvature

$A = -.483 - .087(\ln H)$

$B = e^{(-3.562 + .044(H))}$

$CP = e^{(A + BS)}$

Weight

$A = 1/(.46 + .0344(S) - .00031(S^2))$

$B = 1/(.78 + .0437(S) - .00047(S^2))$

$RW = e^{(-A + B\ln W)}$

$OCOST(FUEL) = RW \times CP \times U$

Tire Consumption in .001's inch of wear per hour

Positive Grade

$A = -8.26 + .095(G)$

$B = 2.23 - .015(G)$

$CP = e^{(A + B\ln S)}$

Negative Grade

$A = -8.26 + .2(G)$

$B = 2.23 - .07(G)$

$CP = e^{(A + B\ln S)}$

Curvature

$A = -3.1 + .59\ln H$

$B = .077 + .0023(H)$

$CP = e^{(A + BS)}$

Weight

$RW = .76 + .061(W)$

$$OCOST(TIRES) = RW \times CP \times U$$

Oil Consumption in quarts per hour

Grade

$$A = -3.414 - .0184(G)$$

$$B = .0242 + .00142(G)$$

$$CP = e^{(A + BS)}$$

Weight

$$A = .930 + .003(S)$$

$$B = -.0149 + .0004(S)$$

$$RW = 1/(A + BW) \text{ where } W \leq 50$$

$$RW = 3W/(30 + S) \text{ where } W \geq 50$$

$$OCOST(OIL) = RW \times CP \times U$$

Maintenance Cost

Positive Grade

$$A = 5.828 - .014(G)$$

$$B = 1.278 + .001(G)$$

$$CP = e^{(-A + BLnS)}$$

Negative Grade

$$A = 5.828 - .0285(G)$$

$$B = 1.278 - .011(G)$$

$$CP = e^{(-A + BLnS)}$$

Weight

$$A = .12 + .0084(ABS(S-20))$$

$$B = .315 + .0021(ABS(S-20))$$

$C = .00438 + .000023(ABS(S-20))$

$RW = -A + BW - CW^2$ where $W \leq 50$

$RW = 4.68 + .039(ABS(S-20)) + (.0772W - 50)$ where $W \geq 50$

$OCOST(MAINT) = RW \times CP \times U$

Depreciation

$B = 1974(S)^{.489}$

$C = 47.5 - 3.88(LnB)$

$CP = S/(B \times C)$

Weight

$RW = e^{(.163 - .031W)}$

$OCOST(DEPREC) = RW \times CP \times U$

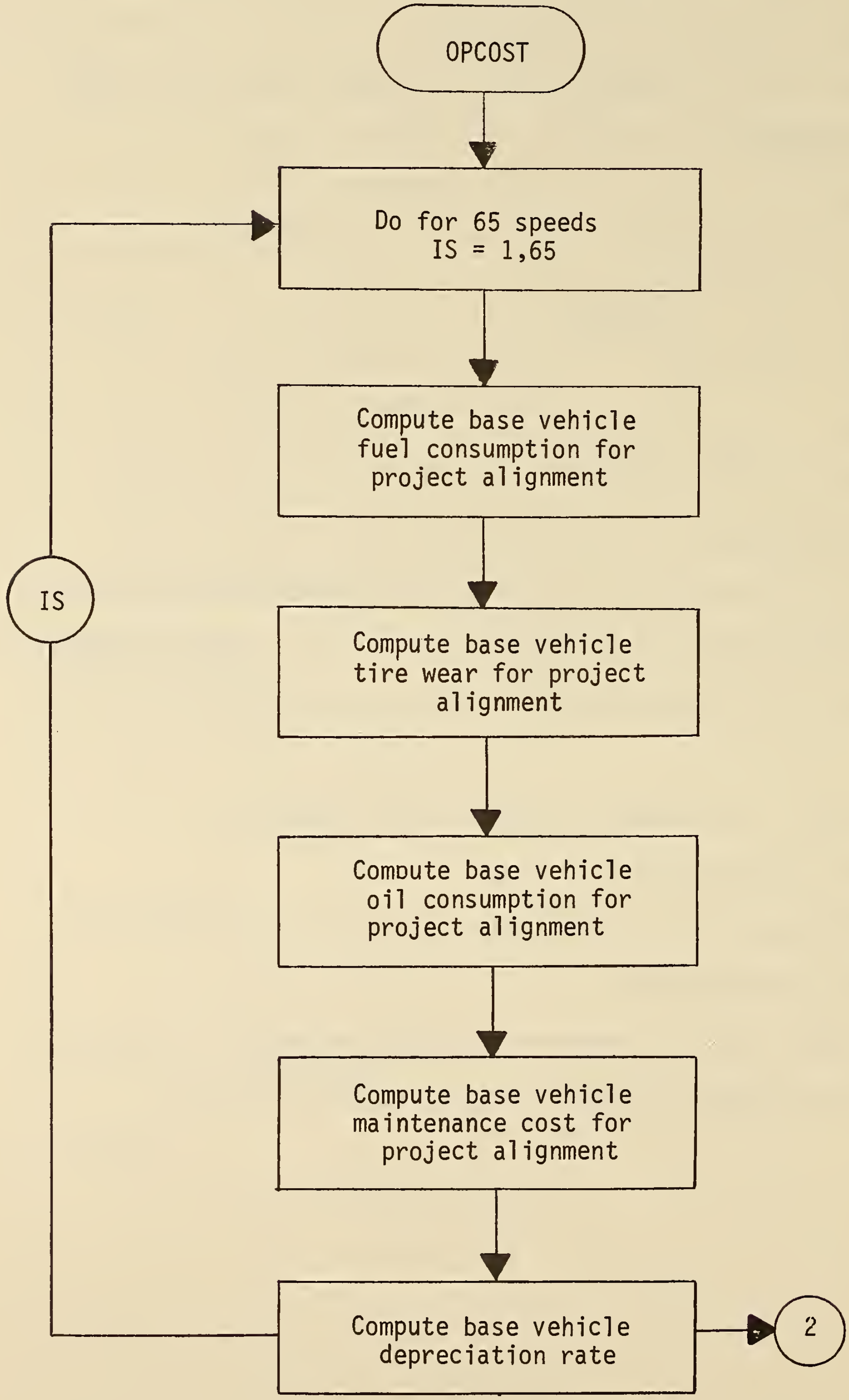
Once all the costs for fuel, tires, oil, maintenance and depreciation have been established for passenger cars and a composite commercial vehicle they are combined and placed into a single costs array called OCOSTS.

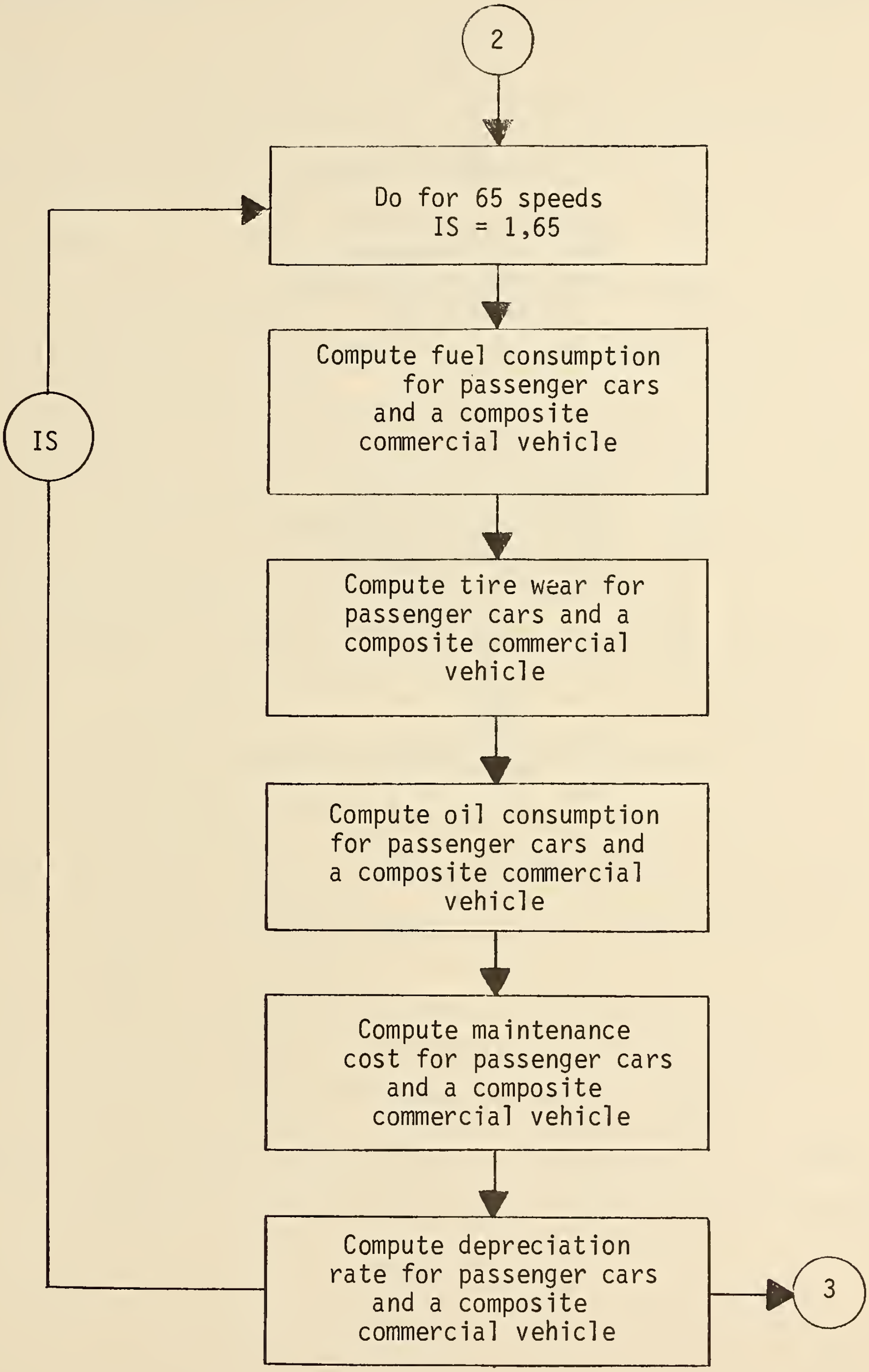
OCOSTS(PC) = OCOST(Fuel) + OCOST(Tires) + OCOST(Oil) + OCOST(Maint) + OCOST(Deprec)

OCOSTS(Commercial) = OCOST(Fuel) + OCOST(Tires) + OCOST(Oil) + OCOST(Maint) + OCOST(Deprec)

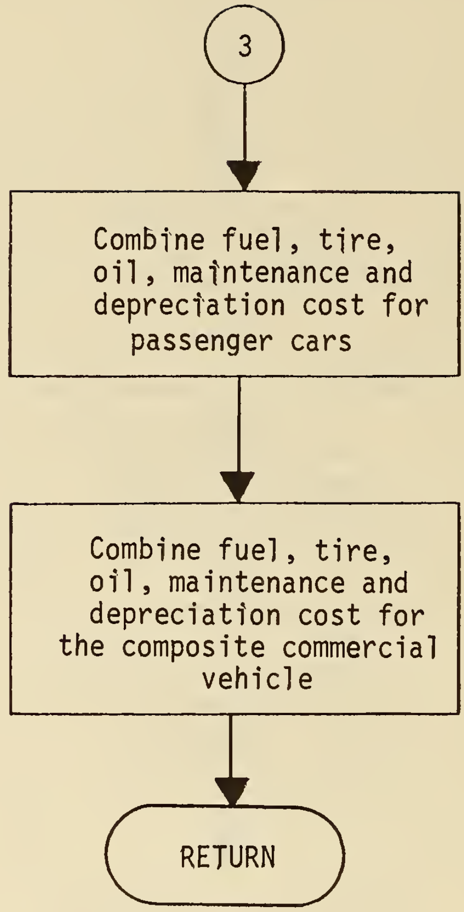
The OCOSTS array is dimensioned to have the operation costs per hour for the 65 speed increments 1 m.p.h. through 65 m.p.h.

General Flow for Routine OPCOST in Program 'EAROMAR'




2
Do for 65 speeds
IS = 1,65
IS
Compute fuel consumption for passenger cars and a composite commercial vehicle
Compute tire wear for passenger cars and a composite commercial vehicle
Compute oil consumption for passenger cars and a composite commercial vehicle
Compute maintenance cost for passenger cars and a composite commercial vehicle
Compute depreciation rate for passenger cars and a composite commercial vehicle
3

OPCOST cont'd.



SUBROUTINE RPRINT

Purpose

This subroutine prints outputs on 8 pages of data which are used in the economic analysis of roadway occupancy.

Description

All of the required input, optional input and program defaults are combined to produce analysis constraints and program costs arrays. The subroutine RPRINT lists these constraints and arrays in an eight-page printout. A default of one is assigned to JPRINT to create this output. The user has the option of suppressing this print in routine of subroutine INITAL.

The output consists of the following information, by page:

Page 1 - A 7-activity by 24-hour matrix showing the available roadway occupancy hours as ones and the unavailable hours as zeroes.

Page 2 - A sample of 50 full-depth patches, partial depth patches and random numbers generated by the routine RANDOM in subroutine INITAL.

Page 3 - A list of the pavement design and traffic data which was either assumed or specified to the program.

Page 4 - A speed matrix for the eleven increments of the volume-capacity ratio for each closure category and the freeway.

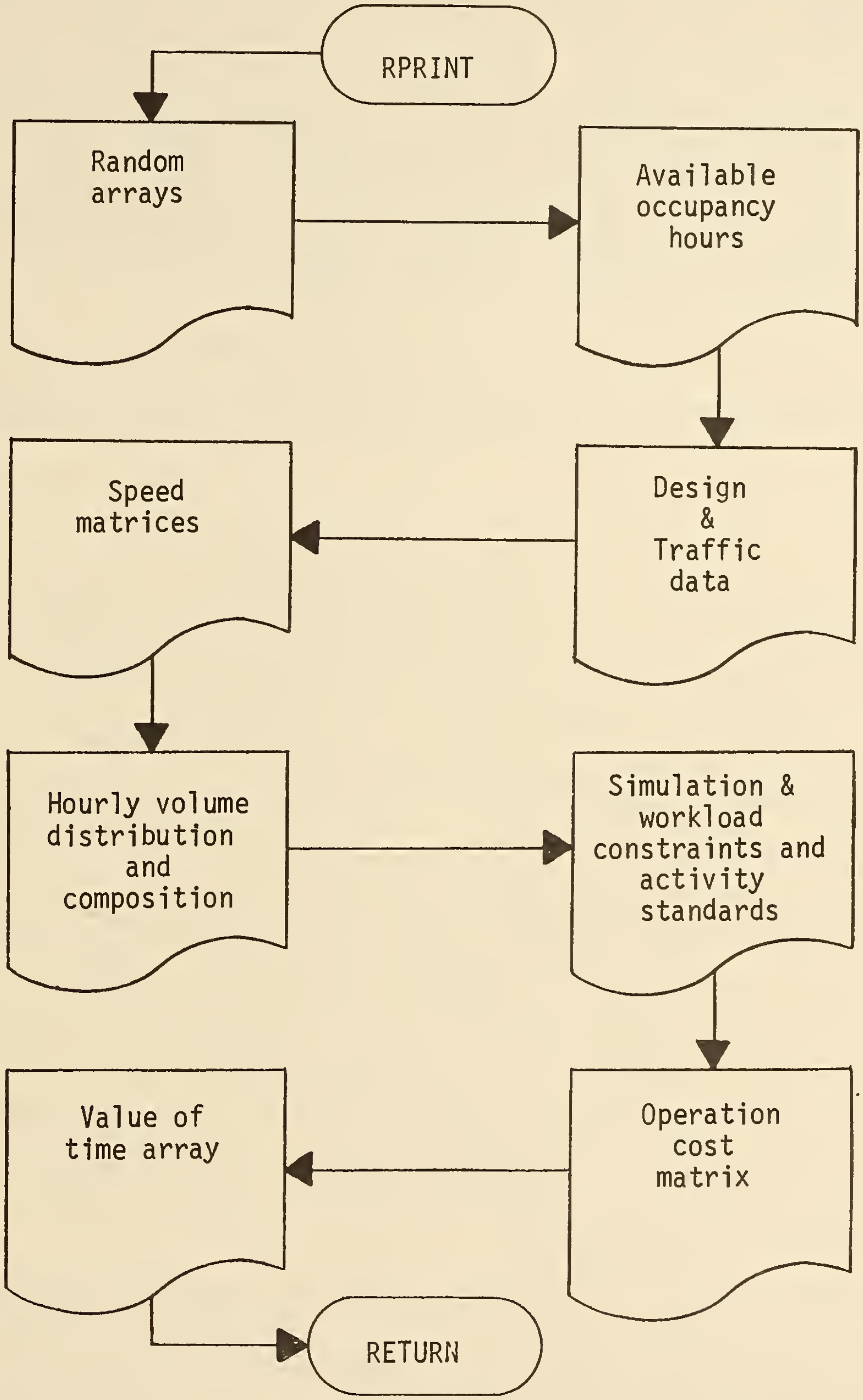
Page 5 - A base year and add-on matrix of the hourly distribution of traffic by direction and trip purpose.

Page 6 - A description of the workload and simulation constraints placed on each of seven work activities together with a description of the activity standard data used by the program.

Page 7 - A matrix of the hourly operation costs for passenger cars and commercial vehicles generated by the program for 64 increments of speed.

Page 8 - A matrix of the hourly value of time for five trip purposes generated by the program for 40 increments of time saved.

General Flow for Subroutine RPRINT in Program 'EAROMAR'



SUBROUTINE YEAR

Purpose

This subroutine is used to control the analysis process. The routines AWORKL and PRINT reside in the subroutine. AWORKL, which generates annual activity workload and PRINT which outputs the analysis results are each described in detail elsewhere.

Each year's analysis by direction is executed by YEAR. Yearly traffic is established and the two subroutines MAINT and MOTOR are called.

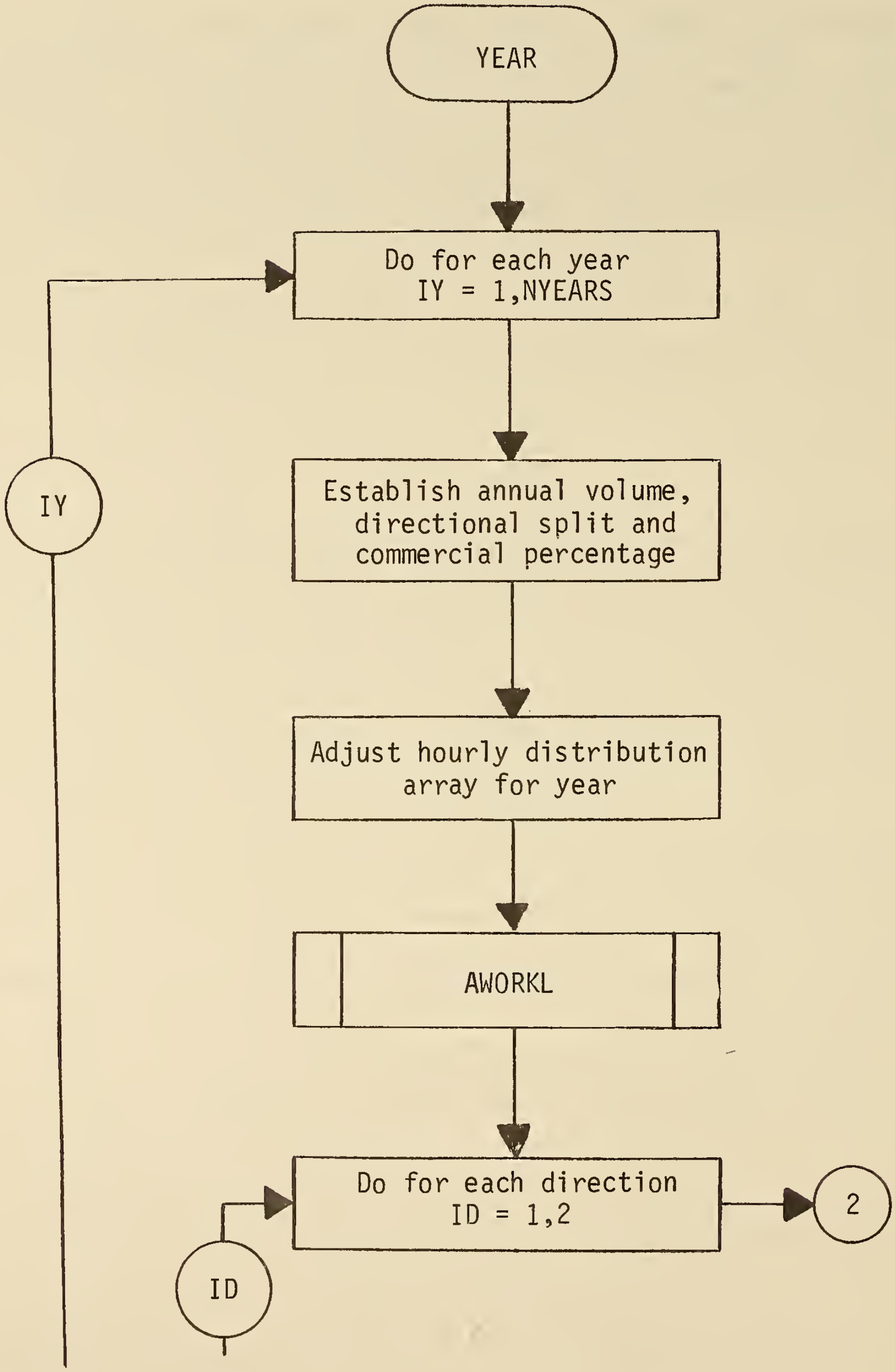
Description

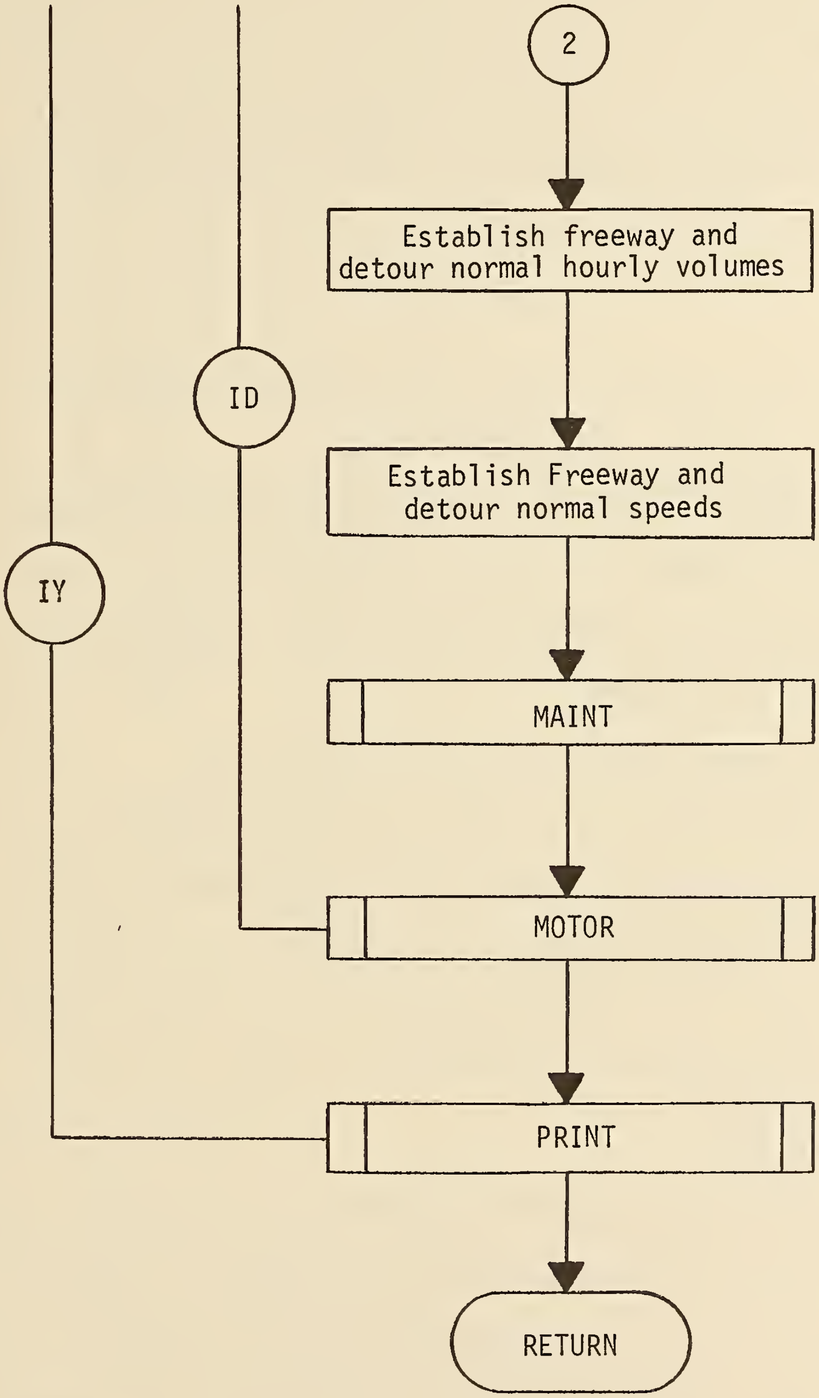
The subroutine YEAR is designed to interface with a pavement design systems program. Transfers of either 18-kip axle loadings or present serviceability index values will suppress the normal programming process for determining these two values. The present serviceability value controls resurfacing cycles.

The hourly traffic array PCTADT, the volume array VOLUME, the directional split SPLIT and the commercial vehicle percentage of total traffic TRUCKS are all structured to be incremented each year. They all have a base level value and add-on value. Each time a new year is iterated, the add-on is added to the base value to create an updated value for the variable.

The direction loop is controlled in subroutine YEAR. For each direction, at each year's iteration, a normal hourly volume is established for the freeway and the detour. The volumes are used to create normal hourly speeds for the freeway and the detour. Once the hourly volume has been determined an average highway speed is determined for the freeway and the detour. Speeds are a function of the hourly volume-capacity ratio and are obtained from the array SP. The subroutine then calls MAINT and then MOTOR where the economic analysis of maintenance costs and motorist impacts is performed.

General Flow for Subroutine YEAR in Program 'EAROMAR'




2
Establish freeway and detour normal hourly volumes
ID
Establish Freeway and detour normal speeds
IY
MAINT
MOTOR
PRINT
RETURN

SUBROUTINE YEAR

ROUTINE: AWORKL

Purpose

This routine through a series of workload models determines the annual workload for all activities associated with a given pavement design.

Description

The execution of this routine requires the following arrays and variables which are generated in subroutine INITAL:

1. The array OVER which provides information on workload factors, or substitutions, work location spacing and maintenance level
2. The arrays VOLUME and TRUCKS which permit the computation of annual 18-kip axle loadings
3. The pavement design life variables DLIFE and RLIFE
4. The age limited 18-kip annual axle loading rate ARHO
5. The following pavement description variables:
   A. 'WIDTH' = Pavement lane width in feet
   B. The pavement type 'ITYPE' where

      1 = Concrete
      2 = Bituminous
      3 = Composite

The subroutine YEAR is designed to interface with a pavement systems program which can transfer information controlling pavement resurfacing. The options from the calling pavement systems program would be a PSI value or the accumulated 18-kip axle loadings. If a pavement systems program identifies resurfacing requirements, it must be accomplished through the transfer of a PSI value equal to a terminal PSI value which is input by the user if the default assumption is not acceptable.

The transfer of accumulated 18-kip axles would negate the need to determine this value in the routine. If the accumulated 18-kip axle loading is not transferred, the program computes and accumulates the 18-kip axles using the following model:

VOLUME -- Annual ADT

TRUCKS -- Percent Commercial

AAXLES -- Accumulated 18-kip axle loadings in millions (composite truck axle loading in 18-kip equivalents)

.735 -- Composite 18-kip axles for each commercial vehicle

ARHO -- Annual rate of 18-kip axle loadings needed to reach 1.5 PSI in 20 years based on AASHO equations

$$AAXLES = AAXLES + (VOLUME/2) \times (TRUCKS)/100 \times 365 \times .735$$

The accumulated 18-kip axles AAXLES are compared with (ARHO x AGE). If the AAXLES axles exceeds the AASHO rate, the pavement age is increased to satisfy the expression AAXLES = ARHO x AGE.

If the PSI is not transferred from a pavement system program it is computed as follows:

PSI_i = Initial pavement present serviceability index

PLIFE = Pavement design life

AGE = Index age equivalent

PSI = Present Serviceability Index

$$PSI = PSI_i - (((PSI_i - 1.5)/DLIFE) \times AGE)$$

Once the PSI has been established, the age is re-established for use in the workload models as follows:

$$AGE = 20 *(PSI_i - PSI)/(PSI_i - 1.5)$$

The PSI value established for the year is compared with the terminal PSI value and if less or equal to it, the maintenance level indicator for the resurfacing activity is set equal to 1 which causes a resurfacing workload to be computed. A resurfaced portland cement concrete pavement is converted to a composite pavement type following the resurfacing.

A unique set of workload models exist for each pavement type in the routine. A workload is computed for each activity that does not have a maintenance level of zero. The following models are used for the indicated pavement types and activities:

A = Equivalent pavement age

F = Workload Factor input

L = Lane Width in feet through OVER

ML = Maintenance Level

W_i = Workload by activity number

S = Workload Spacing in feet

Y = Pavement age in years

<u>Portland Cement Concrete Pavement</u>

Full Depth Concrete Patching:

$$W_i = F \times 34 \times (1/1+e^{-(A-10)/1.25})$$

Partial Depth Concrete Patching:

$W_2 = F \times W_1$ where $W_1 < 1$

$W_2 = F \times 1$ where $W_1 > 1$

$W_1 = W_1 - W_2$

Blowups:

$W_3 = .005 \times (A-4) \times F$ where $A > 5$ or $A < 25$

$W_3 = 0$ where $A < 5$ or $A > 25$

Joint Sealing:

$W_4 = F \times (5280 \times L \times ML)/S$

Mudjacking:

$W_5 = .25(.5y)^2e^{-.5y}$

Other:

$W_6 =$ Constant workload supplied by the program user in the array OVER

Resurfacing:

$W_7 = 586.67 \times L \times F$

Bituminous Concrete Pavement

Bituminous Concrete Patching:

$W_1 = F \times 1100/(1 + e^{-(A-10)/1.16})$

Crack Sealing:

$W_2 = F \times 1100/(1 + e^{-(A-10)/1.16})$

Base and Surface Repair:

$$W_3 = F \times 5/(1 + e^{-(A-10)/1.16})$$

Other:

W_{4-6} = Constant workload supplied by the program user in the array OVER

Overlay:

$$W_7 = 586.67 \times L \times F$$

<u>Composite Pavement</u>

Patching:

$$W_1 = F \times 110/(1 + e^{-(A-10)/1.16})$$

Blowup:

$$W_3 = .005 \times (A-4) \times F \text{ where } A \geq 5 \text{ or } A \leq 25$$

$$W_3 = 0 \text{ where } A \leq 5 \text{ or } A \geq 25$$

Crack Sealing:

$$W_4 = F \times 1000/(1 + e^{-(A-10)/1.16})$$

Mudjacking:

$$W_5 = .25(.5y)^2 e^{-.5y}$$

Other:

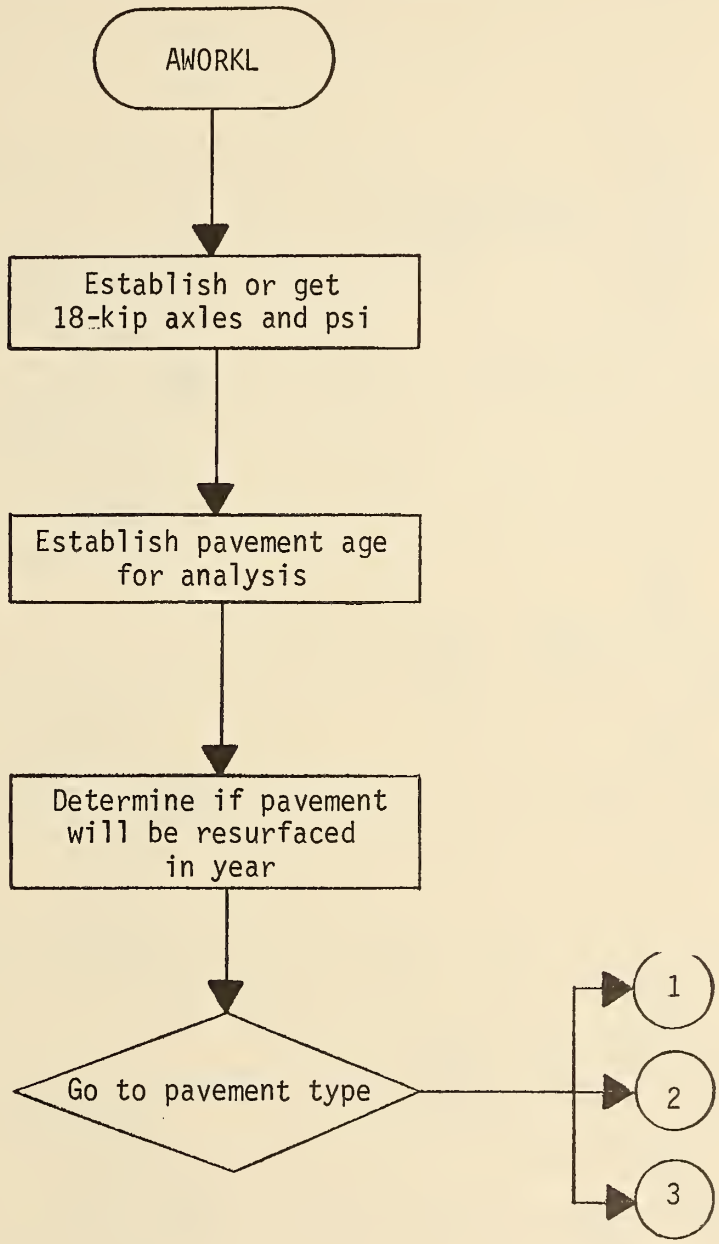
W_2, W_6

Overlay:

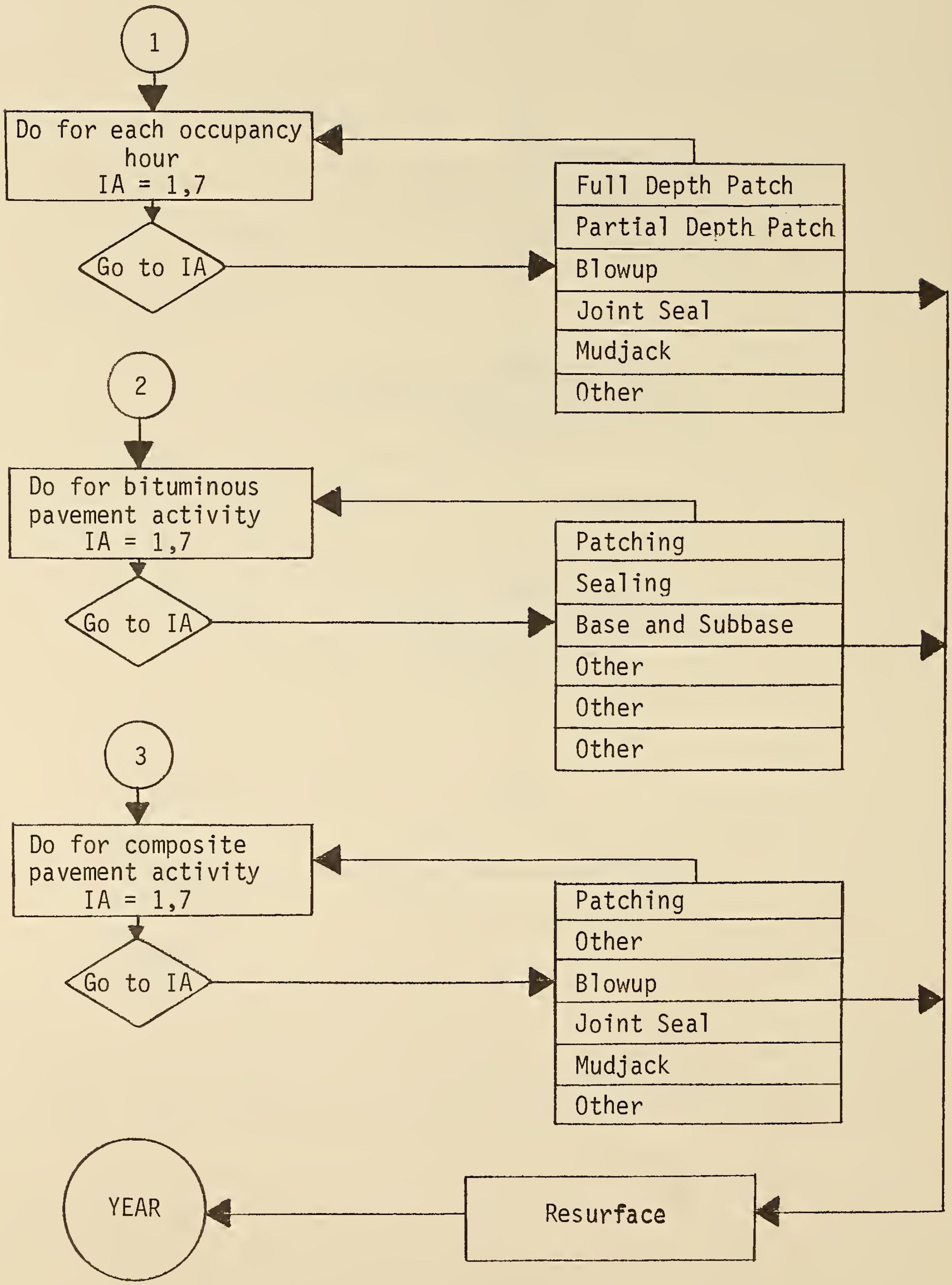
$$W_7 = 586.67 \times L \times F$$

Any time the pavement is resurfaced, the resurfaced age is held to later adjust pavement age to reflect the resurfaced pavement.

General Flow for Routine AWORKL in Program 'EAROMAR'



AWORKL cont'd.



SUBROUTINE YEAR

ROUTINE: PRINT

Purpose

This routine uses the directional cost array, COSTS, to compute the total cost for each activity by closure type, the total cost of all activities for each closure type, the total costs for the year, and the minimum yearly cost for each cost item. In addition, this routine discounts the minimum cost and accumulates the minimum cost for the analysis period. This routine also prints cost summaries at any of the following four levels:

1. Direction
2. Year
3. Yearly minimum cost
4. Minimum cost for analysis

Description

This routine sums the maintenance and rehabilitation, operating, accident, and time costs in the array COSTS to create the total costs for each activity and closure type. While creating these total costs the program selects the closure type for each activity which has the minimum total cost. The minimum costs for each cost item are accumulated in the array TOTALY. Also, the total costs of all activities for each closure type and direction are accumulated in the array ITOTAL.

If IPRINT has been overridden with a value of 1 in routine OVER, then the directional cost array is printed before the two directions of the arrays COSTS and ITOTAL are combined to create costs for the year. If IPRINT has been overridden with a value of one or two then the costs for the year are printed.

After printing of the costs for the year is completed or bypassed, the minimum costs for each cost item is printed if IPRINT has a value less than four.

The minimum costs of accidents maintenance and rehabilitation, operation, lost time and total costs are discounted to present worth using the following equation:

DC = Discounted cost in dollars

MC = Minimum cost in dollars

I = Annual interest rate

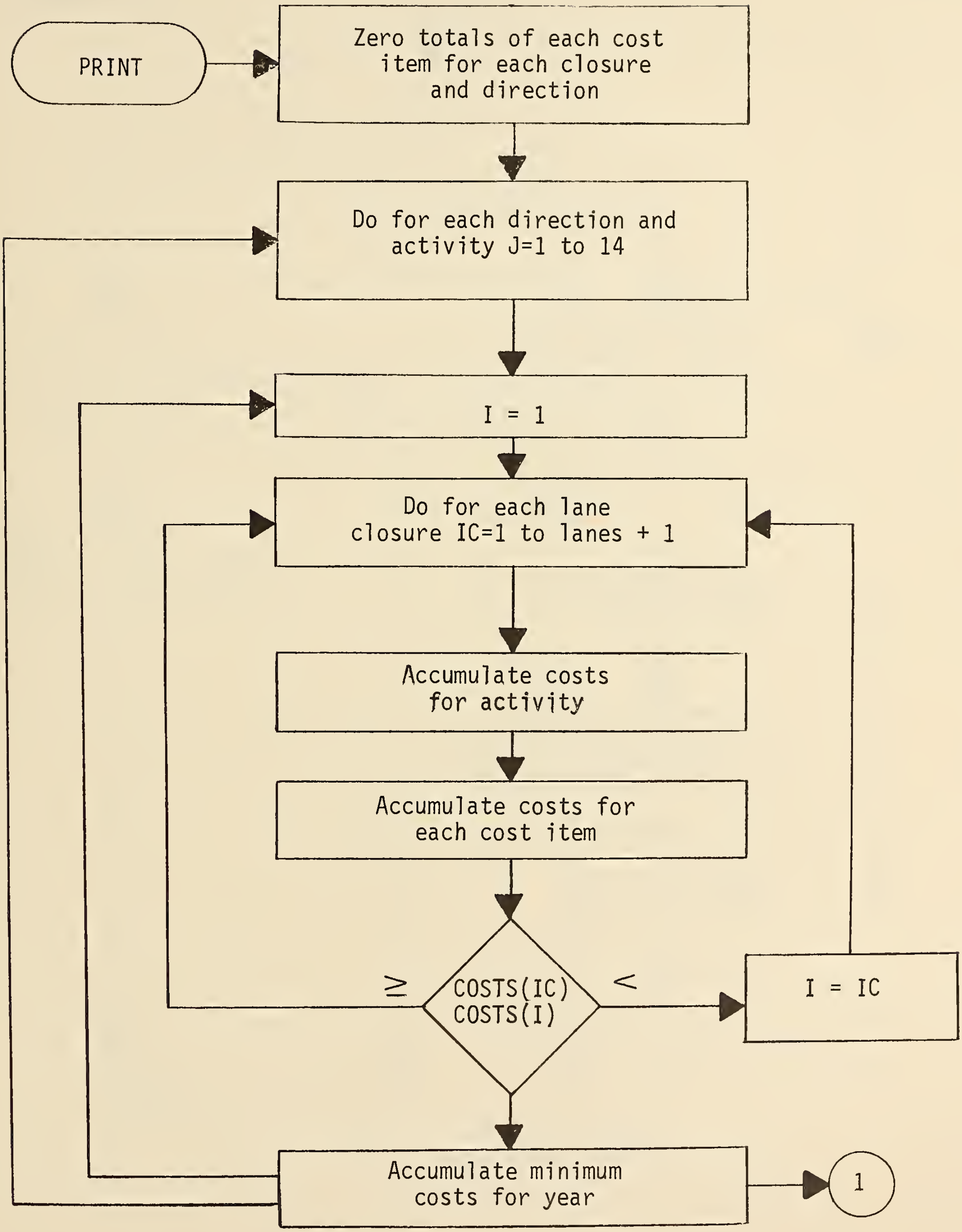
Y = Analysis year number

$$DC = MC/(1+I)^{y}$$

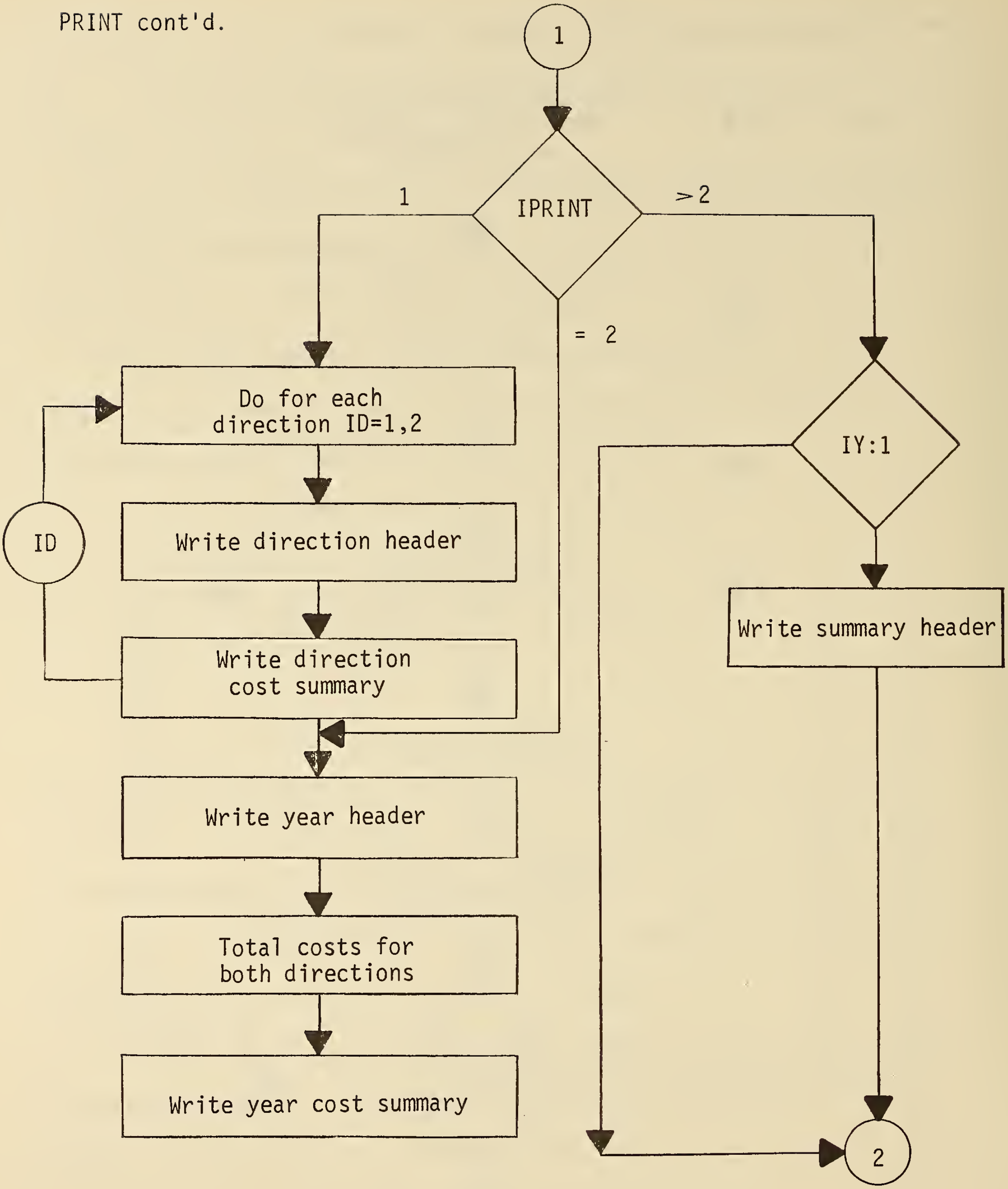
These discounted costs and the values of the non-cost items, days of pollution, hours of time lost, and number of accidents are accumulated for the analysis in the array TOTALA. If IPRINT has a value less than four, both the discounted costs for the year and the accumulated discounted cost are printed for each analysis year.

If IPRINT has a value greater than or equal to four, all printing in this routine is suppressed and the discounted cost for the entire analysis is printed at the end of the analysis.

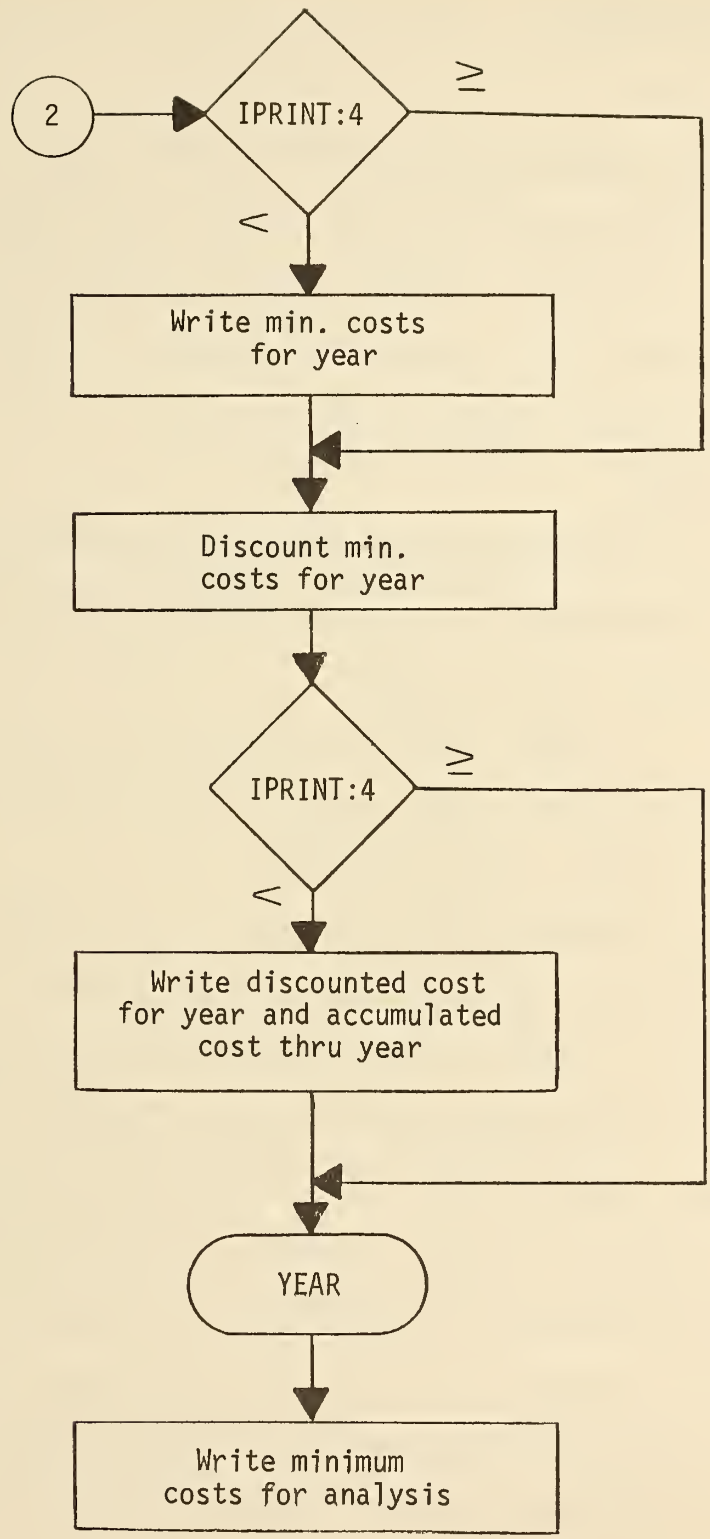
General Flow for Routine PRINT in Program 'EAROMAR'



PRINT cont'd.


1
IPRINT
1
>2
= 2
Do for each direction ID=1,2
Write direction header
Write direction cost summary
ID
Write year header
Total costs for both directions
Write year cost summary
IY:1
Write summary header
2

PRINT cont'd.


2
IPRINT:4
≥
<
Write min. costs for year
Discount min. costs for year
IPRINT:4
≥
<
Write discounted cost for year and accumulated cost thru year
YEAR
Write minimum costs for analysis

SUBROUTINE MAINT

Purpose

This subroutine, through a simulation process, establishes the annual costs for each activity for each lane closure category. Also, the subroutine creates a matrix of the hours of roadway occupancy by hour by activity by lane closure to be used in the subroutine MOTOR where user impacts are established.

Description

The execution of this subroutine requires the following elements which are generated in routines RANDOM and AWORKL which reside in the subroutines INITAL and YEARS:

1. The annual accumulated workload for each activity
2. Simulation arrays for full and partial depth patches and random roadway locations
3. Performance standard data for each activity
4. The maintenance level for each activity
5. The simulation parameters for each activity
6. The permitted hours of roadway occupancy by activity

The subroutine MAINT is called each year by the subroutine YEAR. The maintenance level for each of the seven possible activities is examined to determine if the activity will be performed during the year.

The maintenance level can fall into three categories:

1. If the maintenance level is zero, the maintenance activity is not applicable and therefore the subroutine iterates to the next activity.

2. If the maintenance level is greater than one, the activity will be performed. The maintenance level is truncated and the resulting integer establishes the frequency of the activity during the year. For example, if the maintenance level were 2.1, then the truncated integer becomes 2 indicating that the activity will be performed twice during the year.
3. If the maintenance level is greater than zero but less than one, a holding array for maintenance level must be examined. If the accumulated maintenance level in the holding array exceeds one, then the maintenance level for the year is set equal to one and the holding array is reset to zero. For example, the value .4 may be assigned to the maintenance level. During the first two years the holding array reaches .8. In the third year, the holding array becomes 1.2 which exceeds one, therefore the activity will be performed in the third year, and the array reset to zero (0). Also, it should be noted that all work accumulated during three years will be performed in the third year. The accumulated workload for an activity is divided by the integer maintenance level to establish the magnitude of work which will be present on the roadway when it is occupied by the maintenance forces during the year.

A number of factors must be established prior to simulating the occupancy of the roadway by maintenance forces. These are all based on values established in the subroutine INITAL. Included for each activity are:

1. The simulation parameters
2. Crew travel time
3. Traffic control time
4. Work time
5. Maximum crew work hours
6. Maximum work zone length

The simulation parameters establish the number of simulation iterations, and the nature of the work site for the activity. The maximum number of iterations which can be specified for an activity is 1000. This establishes the reliability of the simulation process when random parameters are used. The nature of the work site is defined in three parts, which are modeled as A, B and C as follows:

$$\text{Work} = (A_i)(B)+C$$

The variable A_i is

A_1 - Full Depth concrete patch or fullsize bituminous patch as established by the density function in subroutine RANDOM.

A_2 - A Partial Depth size concrete patch as established by the density function in the subroutine RANDOM.

A_3 - The number of lanes closed to traffic.

The variable B is a user supplied factor to be applied to the value of A. The variable B can be zero, and would eliminate A.

The Variable C is a user supplied constant which is additive to the worksite model.

Finally, the spacing of the work sites can fall into two categories which are:

1. Randomly spaced
2. Uniformly spaced

The random spacing is based on the spacing array call RLOC generated in subroutine RANDOM. The uniform spacing used is defined in variable OVER, which either designates joint spacing or distance between work sites.

As an example of the simulation parameters, the default assumptions built into the program for mudjacking are as follows:

1. The simulation iterations are 100
2. The worksite description is

   $W = A_2 \times 3 + 10$

3. The spacing is random

This means that the simulation process will cause 100 mudjacking sites to be occupied by a mudjacking crew. At each site, the cubic feet of mudjacking will be W. If the size of the partial depth concrete patch was 20 S.F. then the workload of mudjacking becomes (20x3+10=70) cubic feet. Finally, the spacing is random, so the relative location of the next site will be based on the concentration of the mudjacking workload. The concentration value is computed as follows where

SW - Simulation workload per lane mile

W - Annual workload per lane mile

NA - Maintenance frequency based on level of maintenance

LC - Lanes closed for maintenance

C = Concentration Value = SW/((WxLC)/NA)

The concentration value actually reflects the mileage over which the simulation process will occur. For example, given the following values

SW = 1000 SY/lane mile

W = 10 SY/lane mile

LC = 2 lanes

NA = 1 time per year

$$C = \frac{1000 \text{ SY/lane mile}}{10 \text{ SY/lane mile x 2 lanes}} = \frac{1000}{20} = 50$$

The total mileage over which the simulation of work will occur becomes 50 miles.

There will be 100 random locations between 0 and 1 in the array RLOC which are ordered from 0 to 1. At each iteration the product of RLOC and C produces a random roadway mileage location where the work occurs.

The crew travel time is the allowance made for moving from a maintenance housing facility to the roadway and then returning to the facility at the end of a work day. This is crew time not available for performing productive work on the roadway.

. Traffic Control Time is the time required to establish work site protection and again is not available for performing productive work.

Cure time may not be applicable to all activities, but is treated as time which must be allowed at the end of the productive period of a crew for material to gain the strength it will need before roadway can be open to traffic.

The option is open to the user to specify that crews can work 24 hours. This means that the roadway will remain closed continuously until all work is completed. Additionally, all 24 hours are classified as productive, meaning no time is deducted for travel, traffic control or cure. Otherwise, crew work time is specified and travel time subtracted to get net crew work time available.

The maximum work zone length establishes how frequently a new traffic control zone must be established. Allowance is made for moving to and installing a new traffic control zone once the assignments of worksites falls beyond the maximum zone length.

The process of simulating the maintenance work for a given activity involves the following steps:

1. The first lane closure configuration is selected and the routine AVAIL called to establish the first available occupancy hour and the length of time the maintenance occupancy is allowed.
2. The available time is compared with net crew time and the lesser of the two used to establish the maximum occupancy period.

3. The location of the first work site is established in mileage stationing.
4. The time required to complete the production work at the first site is determined.
5. The total time required to complete the work at the first site is determined and compared with the available occupancy period. If the available occupancy is exceeded, work is terminated for the occupancy. Regardless of the time required at the first site, the work is allowed to be done.
6. The location of the next work site is established and a determination made as to whether it falls within the allowed maximum traffic control zone. If within the zone, allowance is made for moving to the work site and performing the production work. If work falls outside of the zone, allowance is made for moving to a new zone, installing traffic control and performing the productive work. Either way, time is accumulated and tested against total available occupancy time. The length of each traffic zone, together with a count on the traffic zone is maintained so that an average zone length can be established for each closure configuration. If the available time is exceeded, then the work is terminated at the completion of work at the previous site. If the available time is not exceeded, a new work site is iterated.

7. Following the termination of each occupancy period, the following information is accumulated:

   a. One hour of occupancy is added to each appropriate hour of a 24-hour occupancy array.

   b. The total crew hours including travel time is accumulated.

8. The iteration process continues until the simulation process is complete.

Following the simulation for each activity and lane closure, the accumulated crew hours and occupancy hours are factored to reflect the crew hours and occupancy hours to be associated with doing the annual work load. This requires that the ratio of annual workload for the simulation workload be determined and multiplied times the project length. This is done as follows:

Given SW = Simulation Workload

W = Annual workload per lane mile

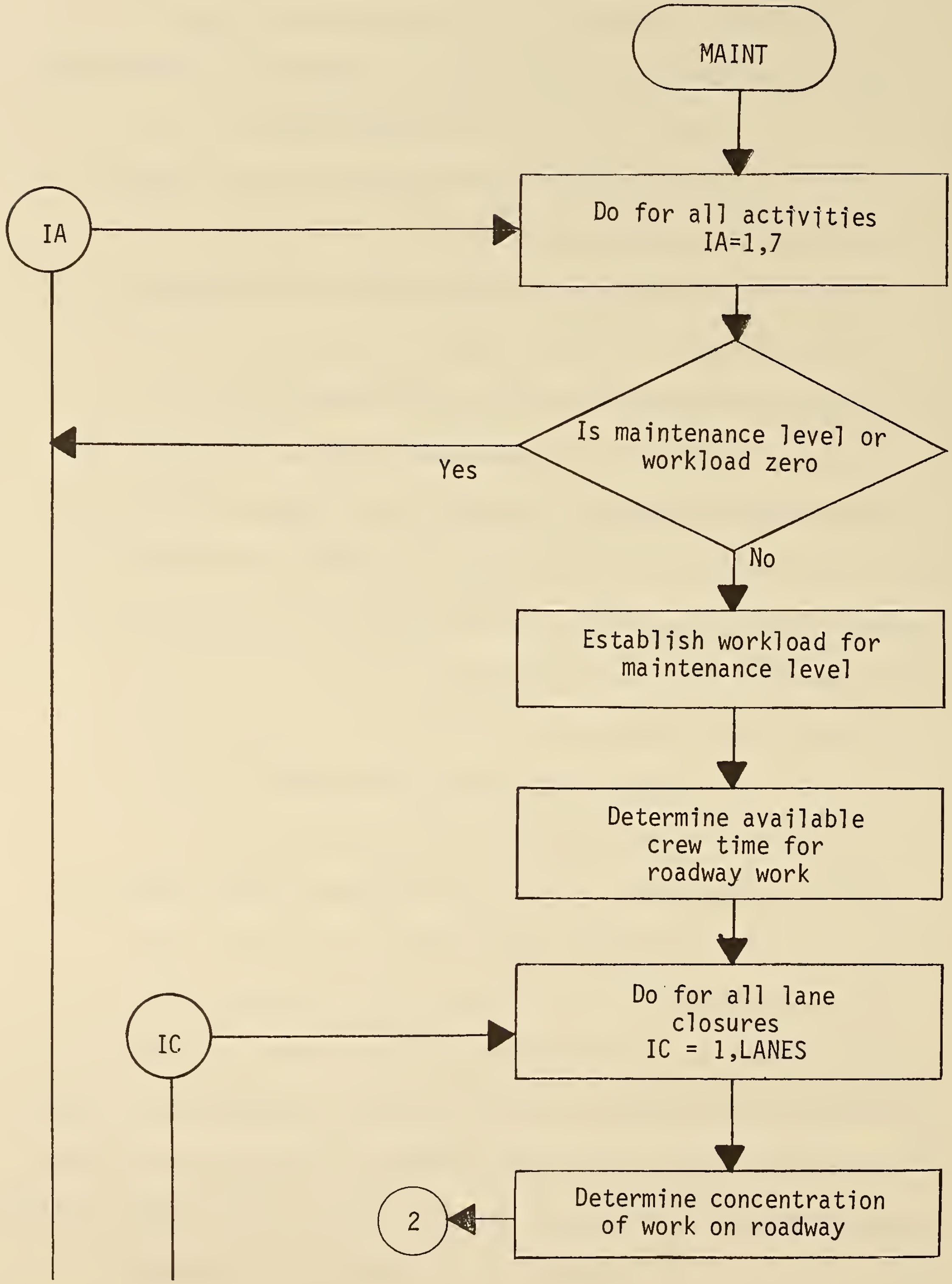
P = Project length in lane miles

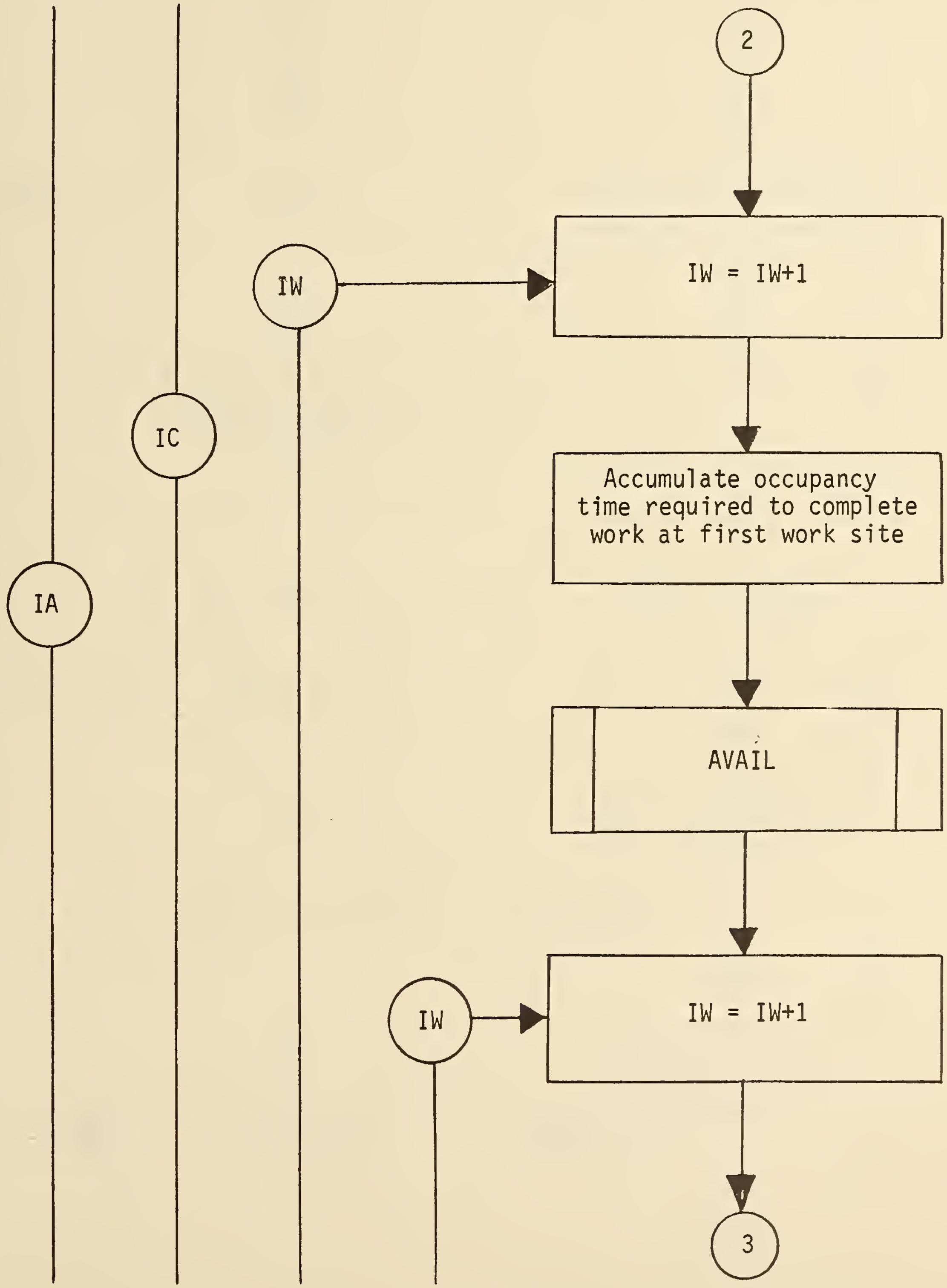
R = Ratio factor to be applied to crew hours and occupancy hours

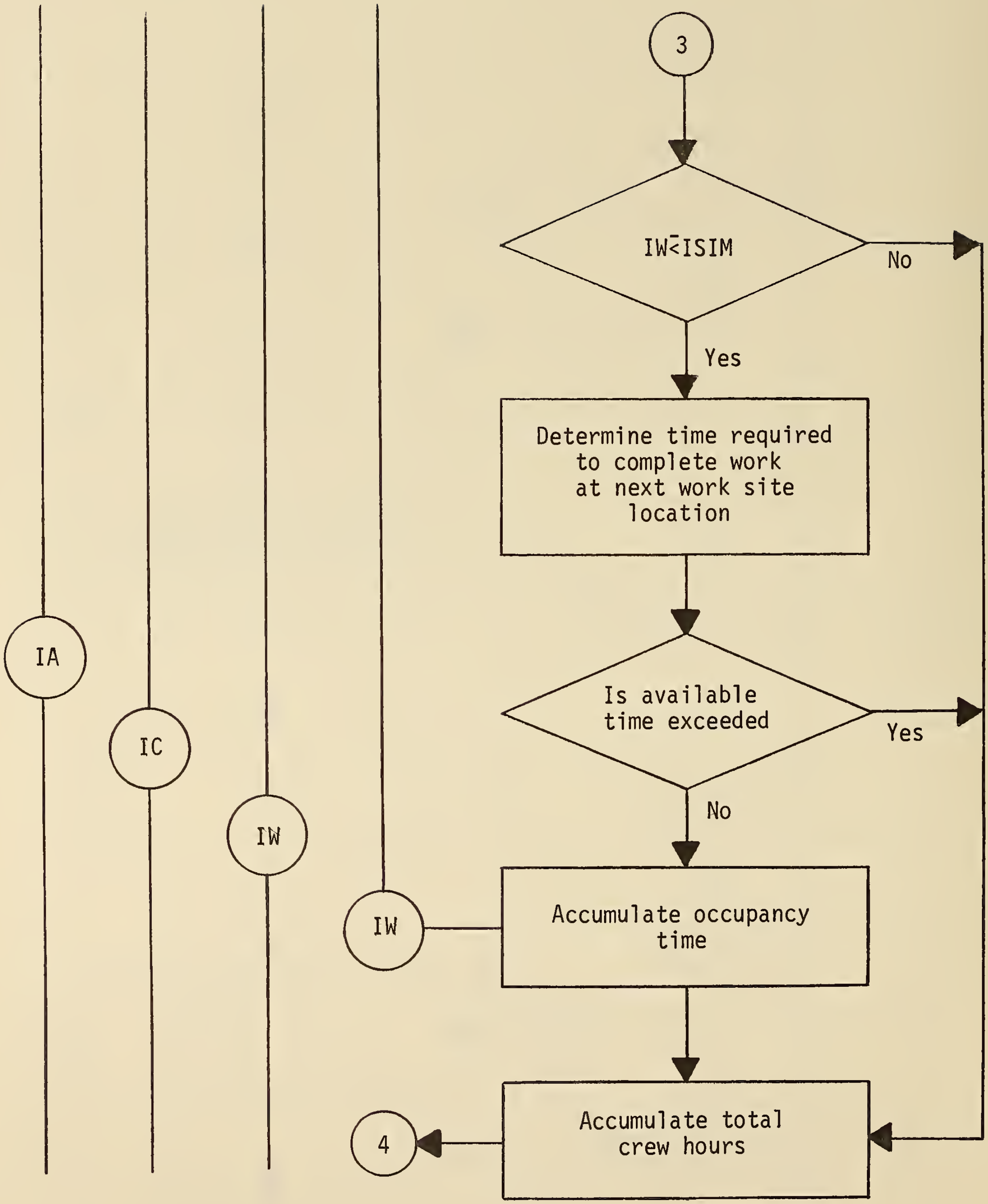
$R = (W \times P)/S$

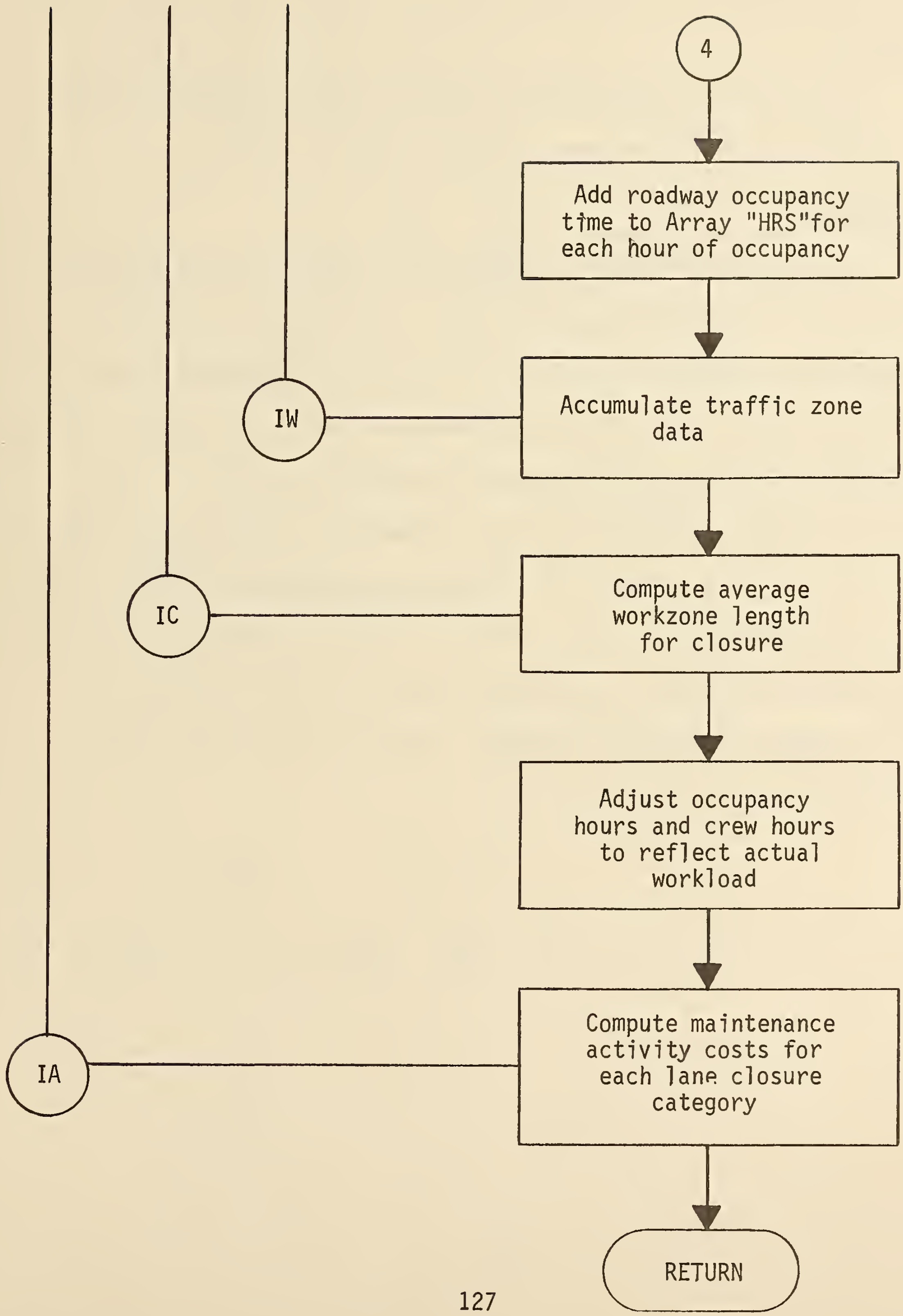
For the determination of the maintenance cost to be associated with a given activity and lane closure, the program branches to the appropriate freeway type (4-, 6-, or 8-lane) and the crew hours for each closure sequence is expanded to dollars using the performance standard data.

General Flow for Subroutine MAINT in Program 'EAROMAR'




2
IW = IW+1
IW
IC
IA
Accumulate occupancy time required to complete work at first work site
AVAIL
IW = IW+1
IW
3


3
IW≤ISIM
No
Yes
Determine time required to complete work at next work site location
Is available time exceeded
Yes
No
Accumulate occupancy time
Accumulate total crew hours
IA
IC
IW
IW
4


4
Add roadway occupancy time to Array "HRS"for each hour of occupancy
IW
Accumulate traffic zone data
IC
Compute average workzone length for closure
Adjust occupancy hours and crew hours to reflect actual workload
IA
Compute maintenance activity costs for each lane closure category
RETURN

SUBROUTINE MAINT

ROUTINE: AVAIL

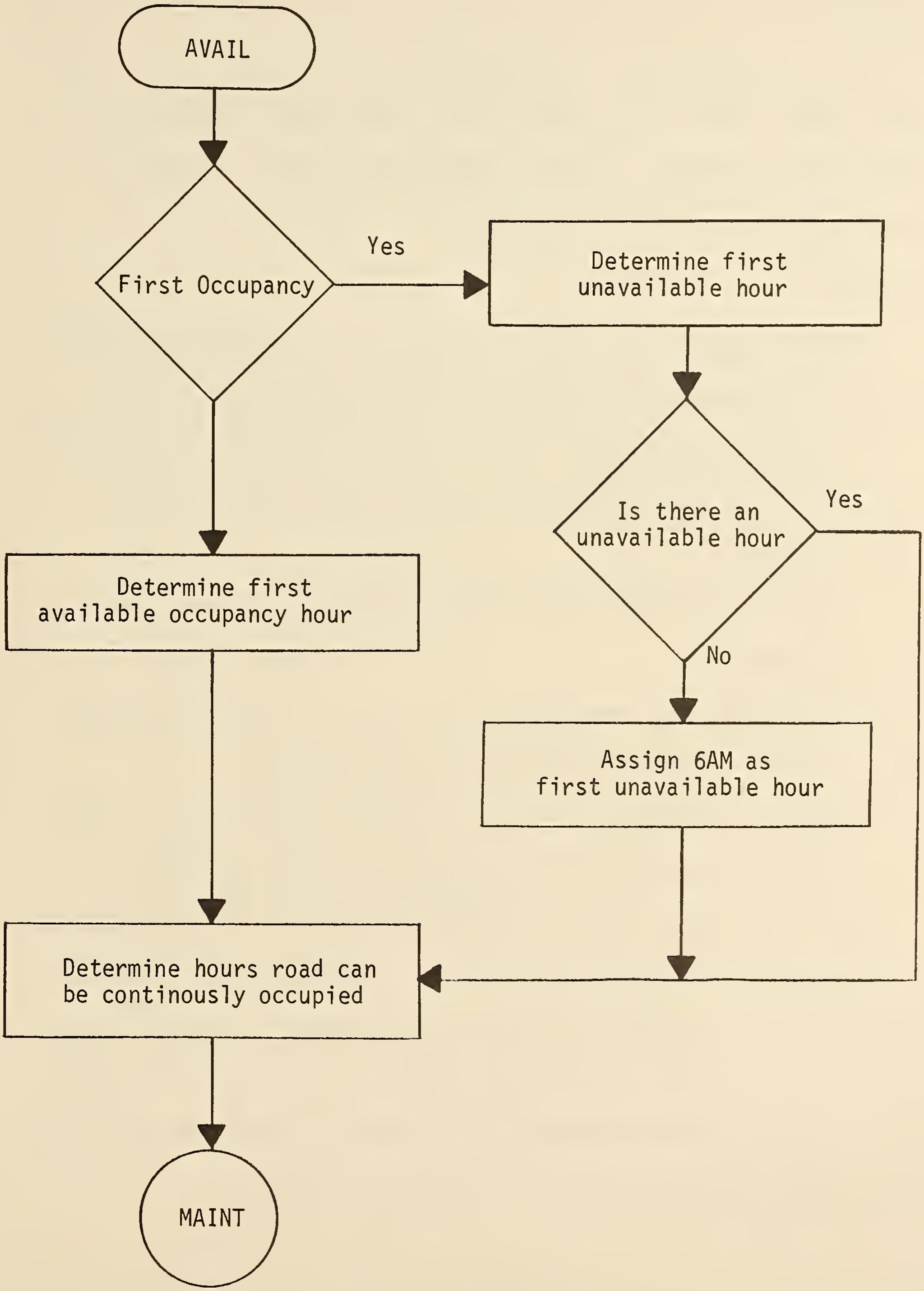
Purpose

This routine is used by the subroutine MAINT to establish the first hour and length of each occupancy interval.

Description

The routine examines the JHOUR array, which shows the hours the road can be occupied for each activity. For the first occupancy interval of a simulation, the start hour follows the first unavailable hour found in the matrix beginning from hour one. The routine then determines the duration of continuous occupancy available. These values are used in MAINT to simulate roadway occupancy by work crews. When the available occupancy is used by the simulation process, AVAIL is again accessed to develop a new start time and occupancy interval. The last available hour is carried forward for each iteration, so that a number of occupancy intervals within a 24-hour period are possible.

General Flow for Routine AVAIL in Program 'EAROMAR'



SUBROUTINE MOTOR

Purpose

This subroutine takes the manhours array developed in the subroutine MAINT and for each activity and lane closure computes the impact on the motorist, in terms of operation, time and accident costs together with pollution effects.

Description

The execution of this subroutine requires the following elements:

1. Array HRS which is generated in the subroutine MAINT and contains the number of days each hour of the day the road has been closed for each maintenance activity and lane closure.
2. The array CAP which provides the capacity of each closure category.
3. The array HVOL and DVOL which holds the hourly directional traffic volume on the freeway and the detour.
4. The array DETOUR which describes the characteristics of the detour required when all directional lanes are closed.

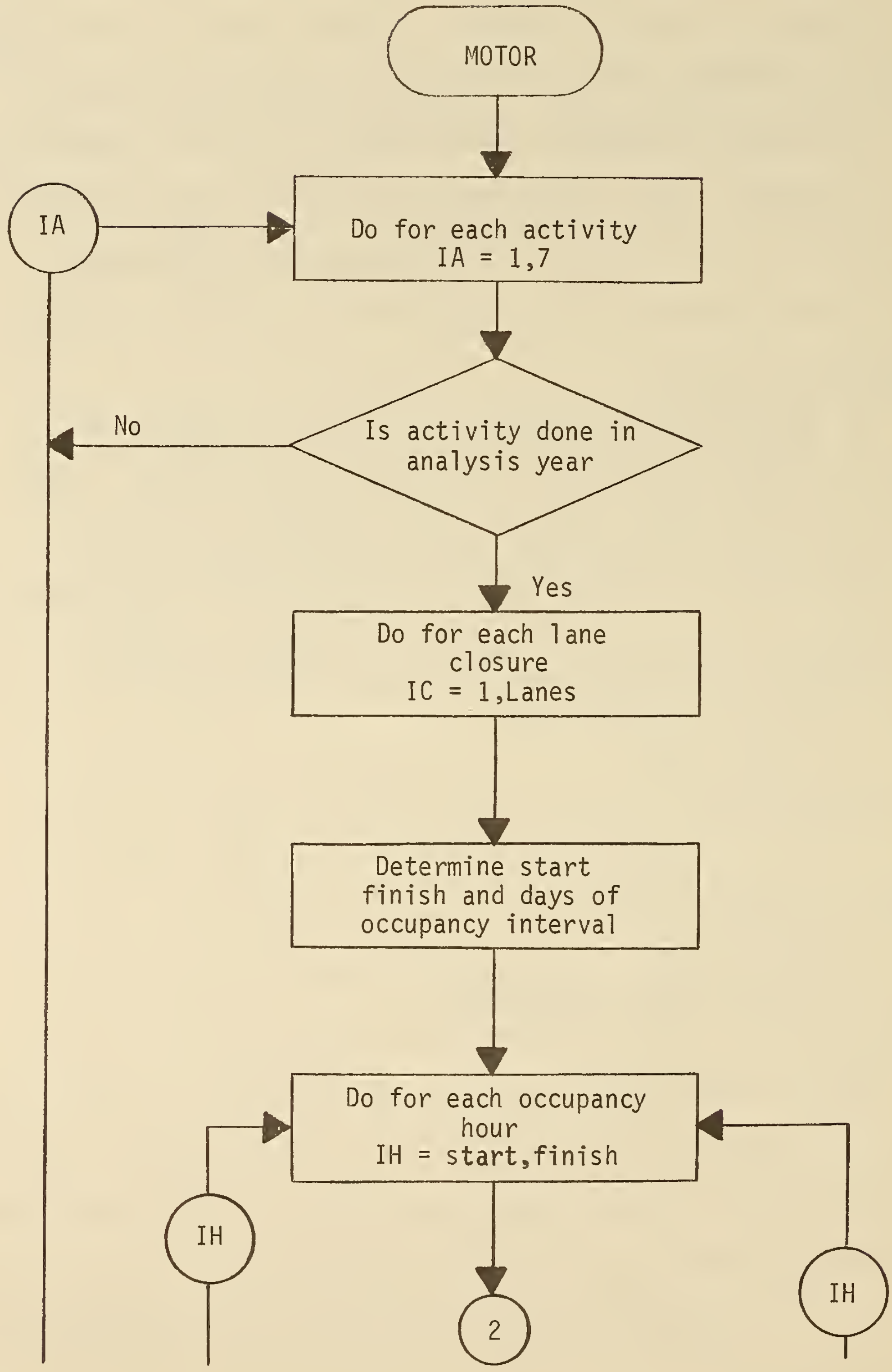
The first and last hour of an occupancy interval are established and the number of days that the occupancy interval lasts is determined for use in computing the magnitude of motorist impacts. The program then establishes the volume, delay and average vehicle speed for all vehicles passing through the restricted roadway occupancy area or on a detour for each hour in the occupancy interval.

The volume is based on a closure category capacity which has been adjusted for commercial traffic. Volume in excess of capacity is held in a queue. The delay to the first and last vehicle in an hour is based on the magnitude of the queue at the start and end of an hour interval. These two delays are averaged and the resulting mean assigned as the delay to the volume passing through the restricted zone during the hours. The speed is a function of the volume/capacity ratio.

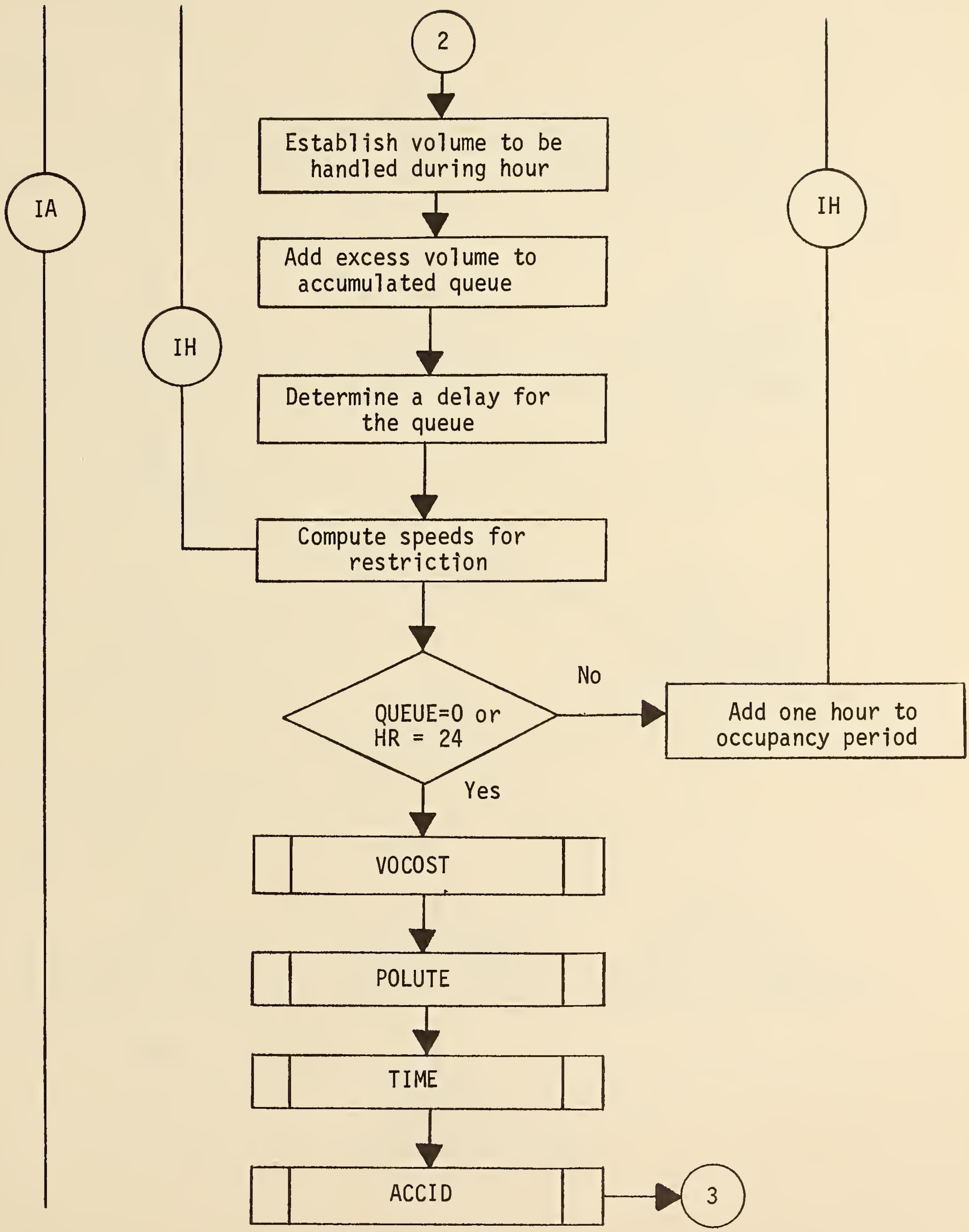
The subroutine then branches to the routines OPERAT, TIME, ACCIDT and POLUTE and computes data for each lane closure. These data are appropriately combined for the closure categories which are feasible for the freeway type being considered. This produces the following output arrays by activity and closure category:

1. Vehicle operation costs
2. Accident costs
3. Accidents
4. Value of time loss
5. Manhours loss
6. Increased days of pollution

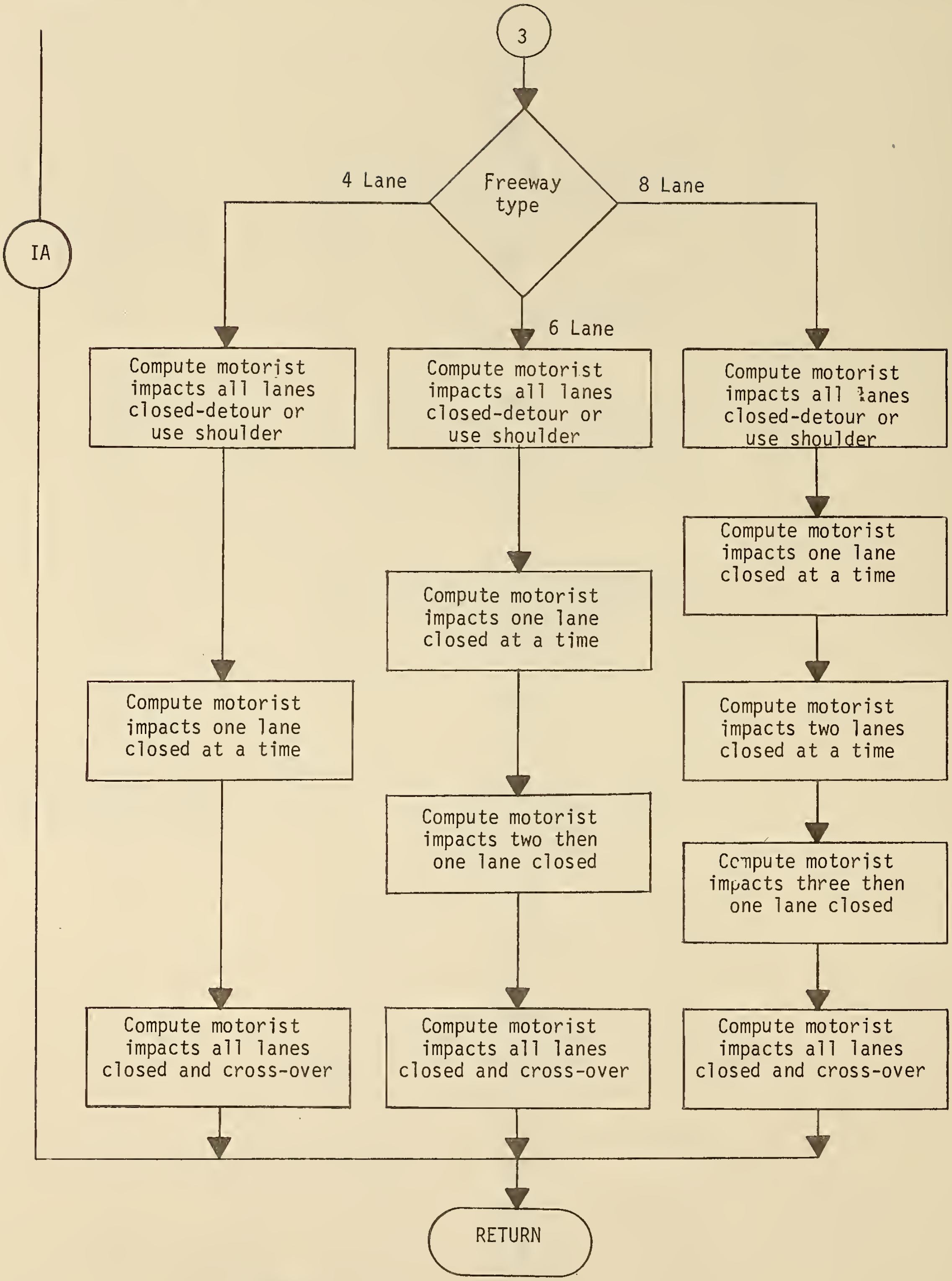
General Flow for Subroutine MOTOR in Program 'EAROMAR'



MOTOR cont'd.


2
Establish volume to be handled during hour
Add excess volume to accumulated queue
Determine a delay for the queue
Compute speeds for restriction
QUEUE=0 or HR = 24
No
Add one hour to occupancy period
Yes
VOCOST
POLUTE
TIME
ACCID
3
IA
IH
IH

MOTOR cont'd.


3
Freeway type
4 Lane
6 Lane
8 Lane
IA
Compute motorist impacts all lanes closed-detour or use shoulder
Compute motorist impacts all lanes closed-detour or use shoulder
Compute motorist impacts all lanes closed-detour or use shoulder
Compute motorist impacts one lane closed at a time
Compute motorist impacts one lane closed at a time
Compute motorist impacts one lane closed at a time
Compute motorist impacts two lanes closed at a time
Compute motorist impacts two then one lane closed
Compute motorist impacts three then one lane closed
Compute motorist impacts all lanes closed and cross-over
Compute motorist impacts all lanes closed and cross-over
Compute motorist impacts all lanes closed and cross-over
RETURN

SUBROUTINE MOTOR

ROUTINE: VOCOST

Purpose

This routine takes volume, speed and delay data developed in the subroutine MOTOR and determines the change in vehicle operation costs between normal operations and operations during each lane closure.

Description

The execution of this routine requires the following elements:

1. The normal hourly volume and average speed of directional traffic on the freeway and on the detour route which is created in subroutine YEAR
2. The first and last hour of the occupancy interval as established in subroutine MOTOR
3. The hourly volume and average speed of the directional traffic in the influence zone or as diverted to the detour as established in MOTOR
   A. The array OCOSTS which contains passenger car and commercial vehicle operation costs for 65 speeds as created in subroutine OPPARA
4. The unit cost of fuel, oil, tires and maintenance established in subroutine INITAL
5. The length of the influence zone as determined in MAINT and the detour length and composite signals

Four categories of vehicle operation costs are determined by the routine for each hour of the occupancy interval. These are:

1. The normal operating costs on the freeway and on the detour route if applicable
2. The vehicle operating costs during each lane closure
3. The cost of the speed changes created by the land closure
4. The cost of vehicle operation during any delay caused by queuing resulting from a lane closure

The first two cost categories are developed as follows:

Where

S_n = Normal Speed

S_r = Lane closure speed

V_n = Normal volume

V_r = Lane closure volume

O_i = Operation cost for speed i

Z = Average length of lane closure

NC = Normal operation cost

CC = Operation cost during closure

$$NC = O_{s_n} \times V_n \times Z/S_n$$

$$CC = O_{s_n} \times V_r \times Z/S_r$$

When all lanes are closed, one option is to detour traffic. The second option is to allow for a roadway crossover. When the detour option is used the following additional information is needed for the above two categories:

S_d = Speed in detour

V_d = Normal volume on the detour

D = Length of detour

DC = Normal operation cost on detour

$$DC = O_{s_d} \times V_d \times D/S_d$$

The normal operation cost for the detour situation includes both NC and DC or

$$NC = NC + DC$$

The lane closure costs when detour is used requires that the combined freeway and normal detour volumes be combined, therefore CC will be computed as follows:

Where

S_c = Speed of combined volume on detour

V_c = Combined volume on detour

$$CC = O_{s_c} \times V_c \times D/S_c$$

The costs of the speed changes is determined using a series of vehicle operation consumption parameter equations. These consist of the following:

Where

A = Intercept Value

B = Coefficient or variable

C = Coefficient or variable

W = Vehicle Weight

RW = Vehicle weight factor

CP = Consumption parameter

S = Normal speed

SC = Speed change

U = Unit cost

$CSTSC(\ )$ = Cost of speed change

Excess Fuel Consumption Cost

$$A = -8 + .0035 \times S$$

$$B = .91 + .00135 \times S$$

$$CP = e^{(A + B\ln SC)}$$

$$RW = W^{1.2}/5.277$$

$$CSTSC(Fuel) = RW \times CP \times U$$

Excess Tire Wear Cost

$$A = e^{(-4.85 + .046 \times S)}$$

$$B = e^{(-4.7 + .0417 \times S)}$$

$$CP = -A + B\ln SC$$

$$RW = -.64 + .16 \times W$$

$$CSTSC(Tires) = RW \times CP \times U$$

Excess Oil Consumption Cost

$$A = -20.5 + .09 \times S$$

$$B = 1.8$$

$$CP = e^{(A + B\ln SC)}$$

$$RW = e^{(-1.347 + .954 \times LnW)}$$

$$CSTSC(Oil) = RW \times CP \times U$$

Excess Vehicle Maintenance

$$A = 2.56 + 1.31\ln S$$

$$B = 1.3 + .0068 \times S$$

$$CP = (e^{(-A+B \times LnS)})/1000$$

$$A_r = -.298 + .00605 \times S$$

$$B_r = .3642 = .00173 \times S$$

$$C = .00506 - .000025 \times S$$

$$RW = A_r + B_r \times W - C \times W^2$$

$$CSTSC(Maint) = RW \times CP \times U$$

The speed change cost parameters are determined independently for passenger cars and the composite commercial vehicles. They are then totaled to produce a single speed change cost (CS) as follows:

$$CS = CSTSC(Fuel) + CSTSC(Tires) + CSTSC(Oil) + CSTSC(Maint)$$

The speed change used in the computation of speed change costs is computed as follows for different conditions:

1. Reduction from normal speed to lane closure speed with no queue created

   $$SC = (S_n - S_r) \times 1.5 \text{ where } SC < S_n$$

2. Reduction from normal speed to lane closure speed when queue is created

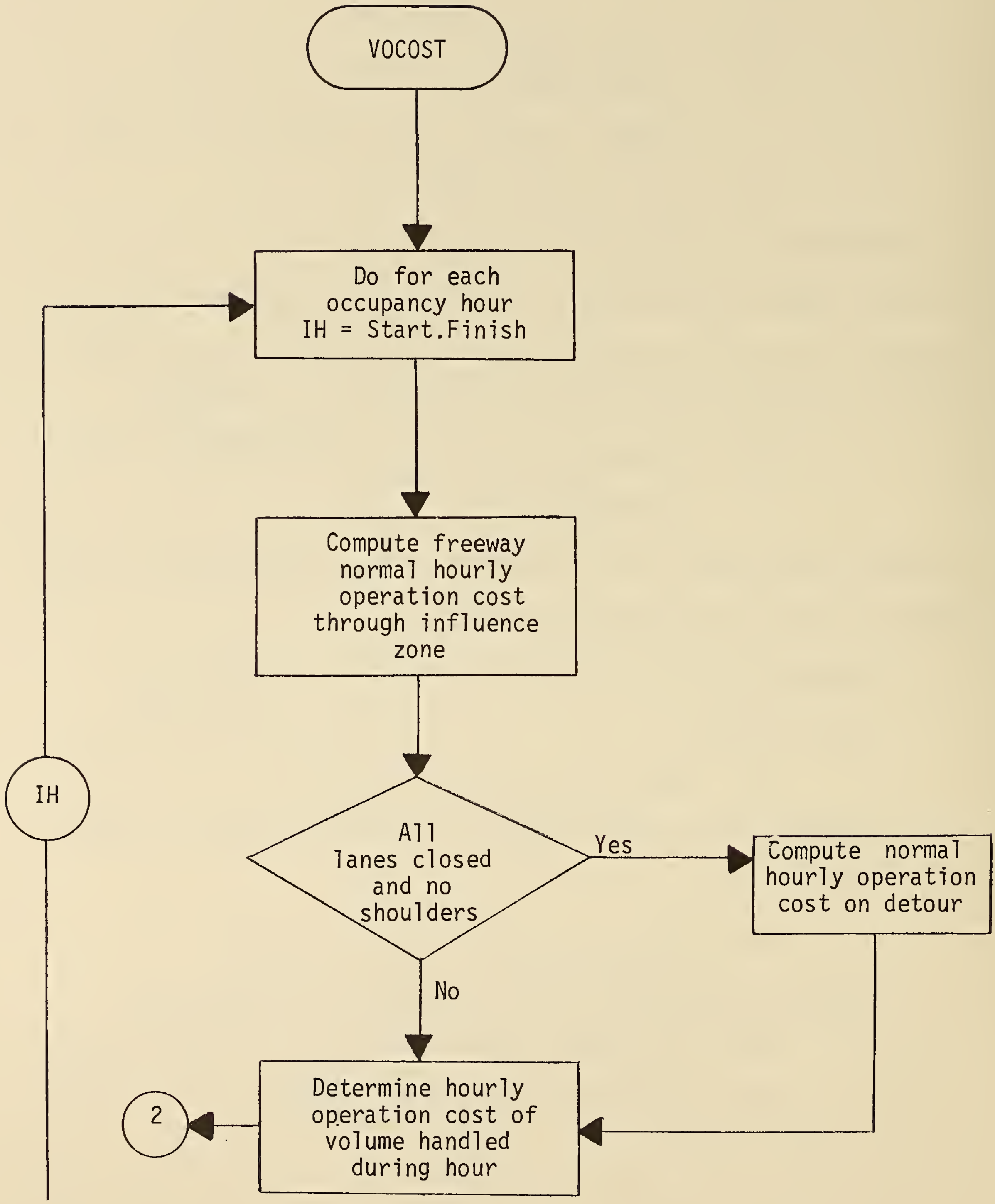
   $$SC = S_n$$

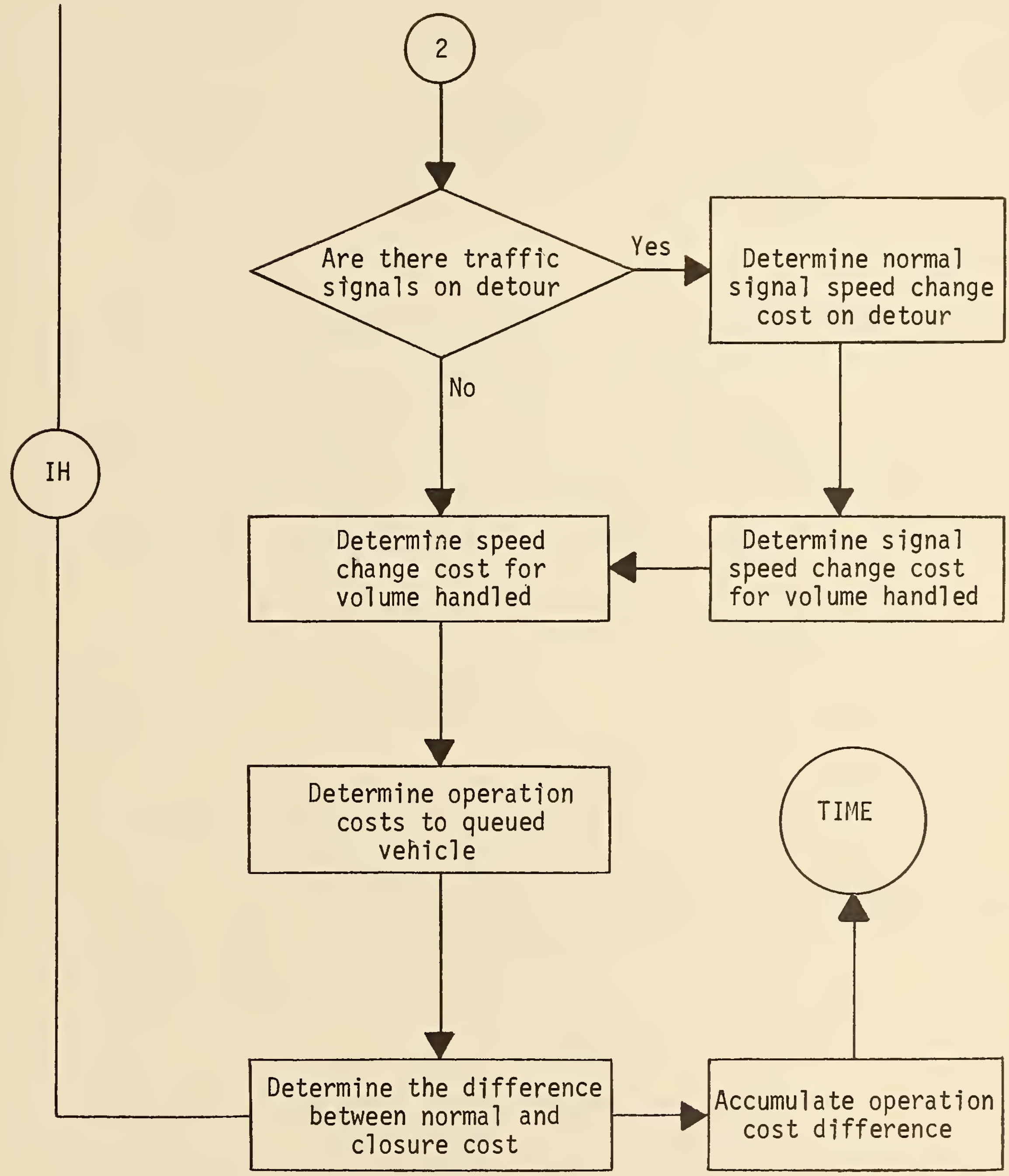
3. Reduction from detour speed to stop for a signal

   $$SC = S_d \text{ (normal detour speed)}$$

   $$SC = S_c \text{ (lane closure detour speed)}$$

General Flow for Routine VOCOST in Program 'EAROMAR'




2
Are there traffic signals on detour
Yes
No
Determine normal signal speed change cost on detour
IH
Determine speed change cost for volume handled
Determine signal speed change cost for volume handled
Determine operation costs to queued vehicle
TIME
Determine the difference between normal and closure cost
Accumulate operation cost difference

SUBROUTINE MOTOR

ROUTINE: TIME

Purpose

This routine computes the total amount of time lost and the dollar value of the lost time.

Description

The execution of this routine requires the following arrays and variables which are generated in the indicated subroutines:

1. The array PCTADT, generated in subroutine INITAL, which provides hourly distributions of traffic by trip purpose
2. The array VTRATE, generated in subroutine OPPARA, which provides passenger car hourly values of time by trip purpose and minutes lost
3. The array DETOUR, defined in subroutine INITAL, which holds the detour route parameters
4. The variable COMVOT, defined in subroutine INITAL, which is the commercial vehicle hourly value of time
5. The arrays HVOL and DVOL, created in subroutine YEAR, which hold the hourly volumes under normal conditions on the freeway and detour, respectively
6. The arrays SPEEDN and SPEED, created in subroutine YEAR, which hold the normal speeds for the freeway and detour, respectively
7. The array ZONEL, created in subroutine MAINT, which holds the average zone length in miles

8. The array AVOL, computed in subroutine MOTOR, which holds the hourly volume passing through the influence zone
9. The array DELAY, computed in subroutine MOTOR, which holds the average delay for the volume AVOL
10. The variables IBEGIN and IEND, generated in subroutine MOTOR, which are the first and last hour of occupancy, respectively
11. The variable DAYS, generated in subroutine MOTOR, which is the number of days the roadway is occupied

This routine is executed hourly for each lane closure by activity. It is assumed that traffic is detoured only when all lanes are closed and no shoulders are open.

When traffic is not detoured the time loss of each motorist is computed using the following equation:

Where

TL = the time lost in hours

ZN = the average zone length in miles

DZ = the deacceleration and acceleration zone (assumed 2 miles)

S_r = the normal speed on freeway

X = speed change

DELAY = the average delay to a motorist

$$TL = ZN_r - ZN/S_n + DZ/(S_n - SC/2) + DELAY$$

Once the time loss has been established, a composite hourly value for that time loss is computed, using the following equation:

Where

VT = the composite hourly value of time in dollars per hour per vehicle

CVT = commercial vehicle value of time in dollars per hour per vehicle

MTL = minutes of time lost

n = trip purpose

$PCT(n)$ = the percentage of total traffic obtained from PCTADT for each trip purpose

$PVT(n)$ = the passenger car value of time obtained from the array VTRATE

$$VT = CVT \times PCT(6) + PVT(1,MTL) \times PCT(1) + \ldots + PVT(5,MTL) \times PCT(5)$$

The composite hourly value of time is multiplied by the time loss to obtain the value of time per vehicle.

Both the value of time per vehicle and the time loss per vehicle are multiplied by the volume passing through the zone to give the total time lost and the value of time lost.

If the traffic is detoured, the time lost by freeway motorist and detour motorist is computed separately using the following equations:

Where

TL_f = The time lost by a freeway motorist

TL_d = The time lost by a detour motorist

D_2 = The length of the detour

D_1 = The distance between interchanges on the freeway in miles

S_d = The normal speed on the detour

$$TL_f = D_2/S_r - D_1/S_n + DELAY$$

and

$$TL_d = D_2/S_r - D_2/S_d + DELAY$$

The composite values of time are computed as to lane for both the detour and freeway motorists. These composite values are multiplied by the appropriate time losses to obtain the values of time per vehicle.

The time losses and values of time for the freeway and detour traffic are appropriately modified and combined to produce a composite time loss and value of time for the detour. The composite time loss and value of time are expanded to totals by multiplying by AVOL.

If any traffic remains in the queue at the end of the day, the time loss associated with these vehicles is evaluated using the following equation.

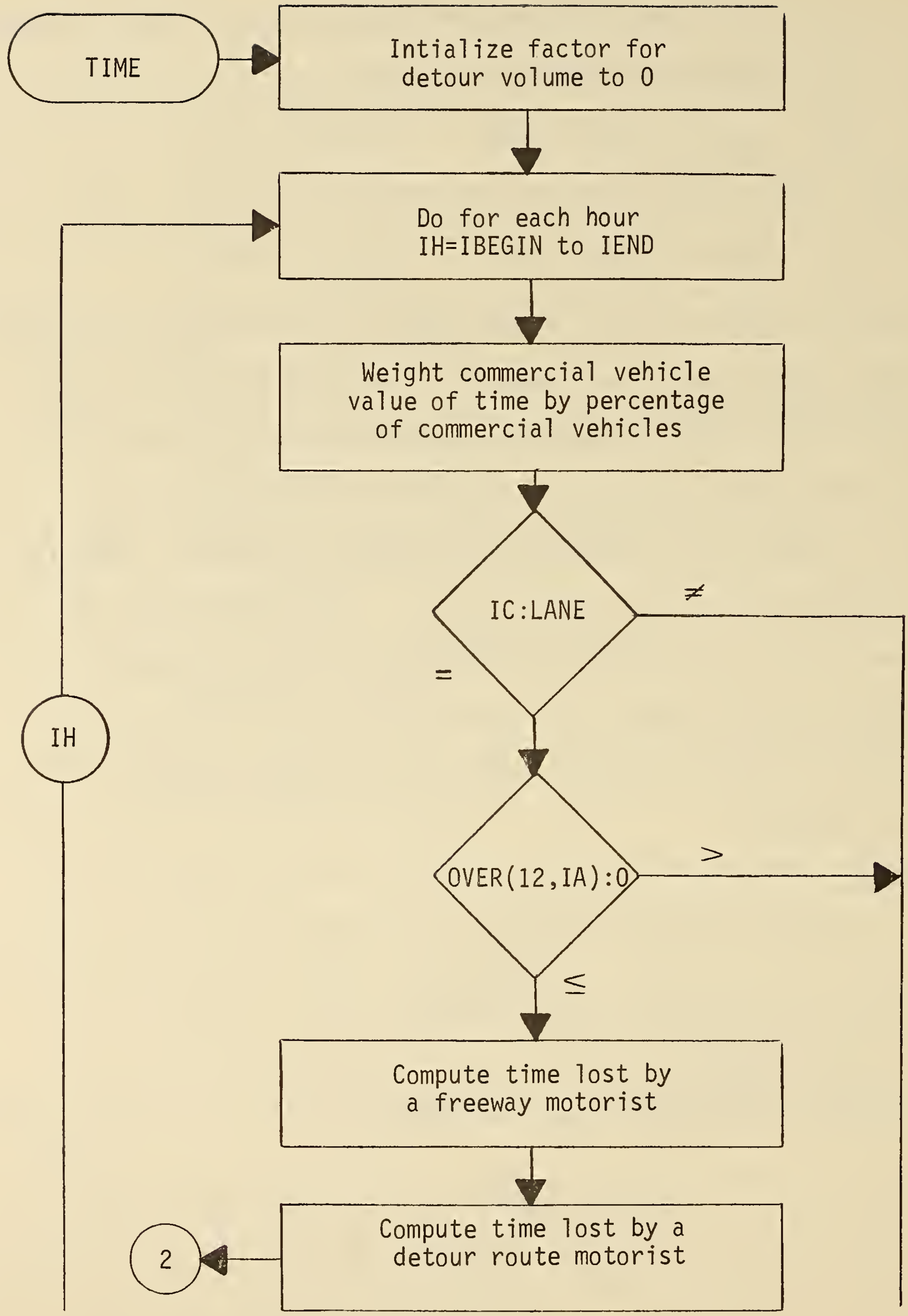
Where

Q = The volume in the queue

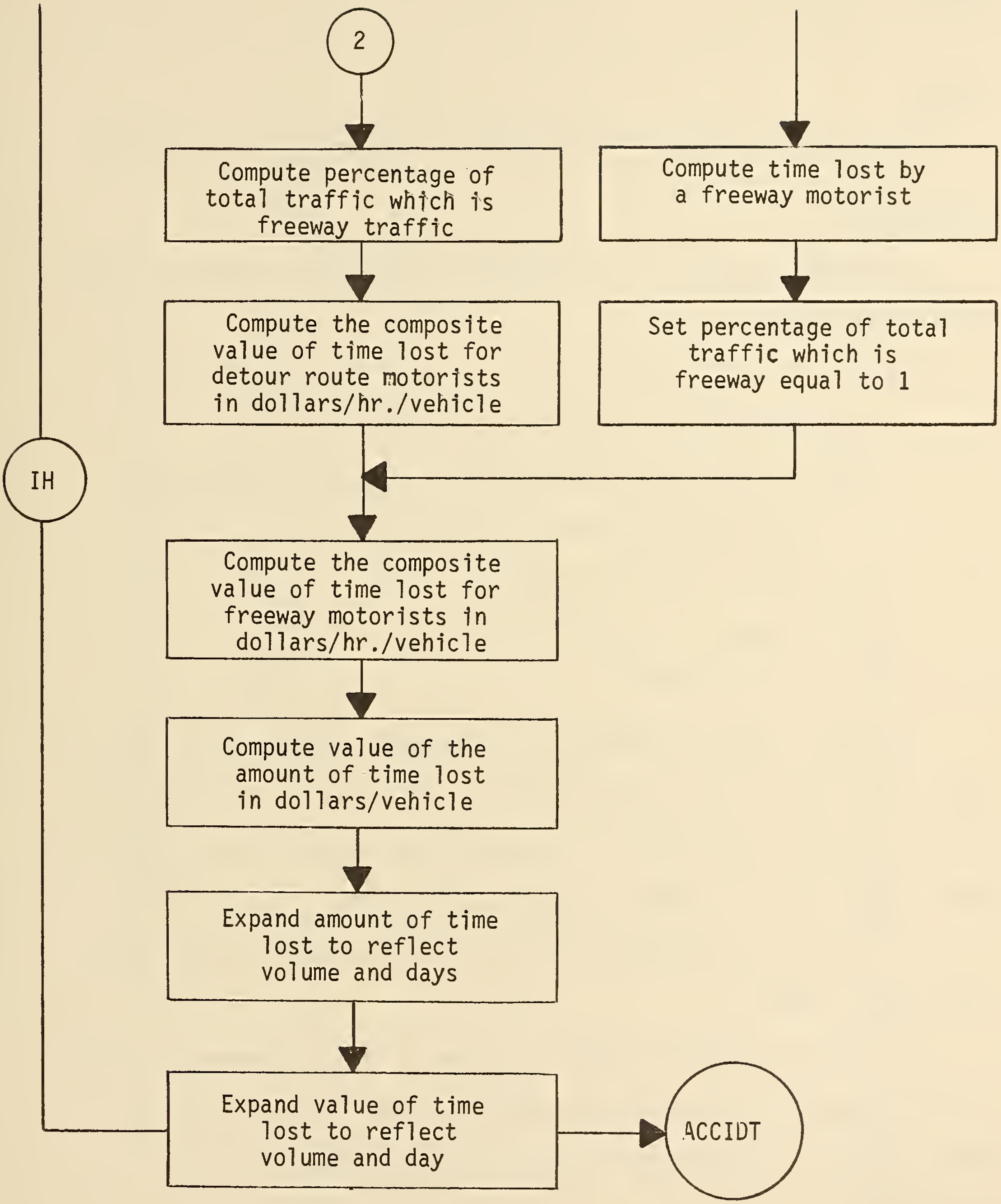
CAP = The capacity of the freeway

$$TL = Q/CAP/2$$

TL is valued and expanded to totals as above.


TIME
Intialize factor for detour volume to 0
Do for each hour IH=IBEGIN to IEND
Weight commercial vehicle value of time by percentage of commercial vehicles
IC:LANE
≠
=
IH
OVER(12,IA):0
>
≤
Compute time lost by a freeway motorist
Compute time lost by a detour route motorist
2

TIME cont'd.


2
Compute percentage of total traffic which is freeway traffic
Compute time lost by a freeway motorist
Compute the composite value of time lost for detour route motorists in dollars/hr./vehicle
Set percentage of total traffic which is freeway equal to 1
IH
Compute the composite value of time lost for freeway motorists in dollars/hr./vehicle
Compute value of the amount of time lost in dollars/vehicle
Expand amount of time lost to reflect volume and days
Expand value of time lost to reflect volume and day
ACCIDT

SUBROUTINE MOTOR

ROUTINE: ACCIDT

Purpose

This routine computes the increased number and cost of accidents.

Description

The annual accidents for a section of roadway are computed using the following model:

Where

A = the annual accidents

a,b & c are constants dependent on directional lanes and access control shown in Table 12.

SL = section length in miles

V = volume

$$A = e^{(a+bLnSL+cLnV)}$$

The normal annual accidents on the freeway, the annual accidents in the influence zone and the normal annual accidents of the detour route are computed using this model. The normal accidents are subtracted from the influence zone accidents to obtain the accident increase. This accident increase is factored by the ratio of the traffic affected to the annual traffic.

In addition to the increased accidents in the influence zone, the accidents caused by deceleration coming into the zone are computed. These accidents are computed using the following equation:

Where

A = The number of accidents

Table 12. Constants of influence zone annual accidents equations taken from NCHRP Report 47.[1]

Constants	Directional Lanes Open						
	Freeway				Detour		
	1	2	3	4	1	2	3
a	-4.39	-5.75	-7.26	-6.14	-4.54	-7.32	.96
b	0.51	0.76	0.77	0.68	0.59	0.67	0.99
c	0.69	0.81	0.95	0.85	0.73	1.06	0.95

[1]Kehlberg, Jaakko K. and Thorp, K. J., "Accident Rates as Related to Design Elements of Rural Highways", NCHRP Report 47, pp. 101 (1968).

DEC = The deceleration rate in miles per hour per hour

V = The Volume

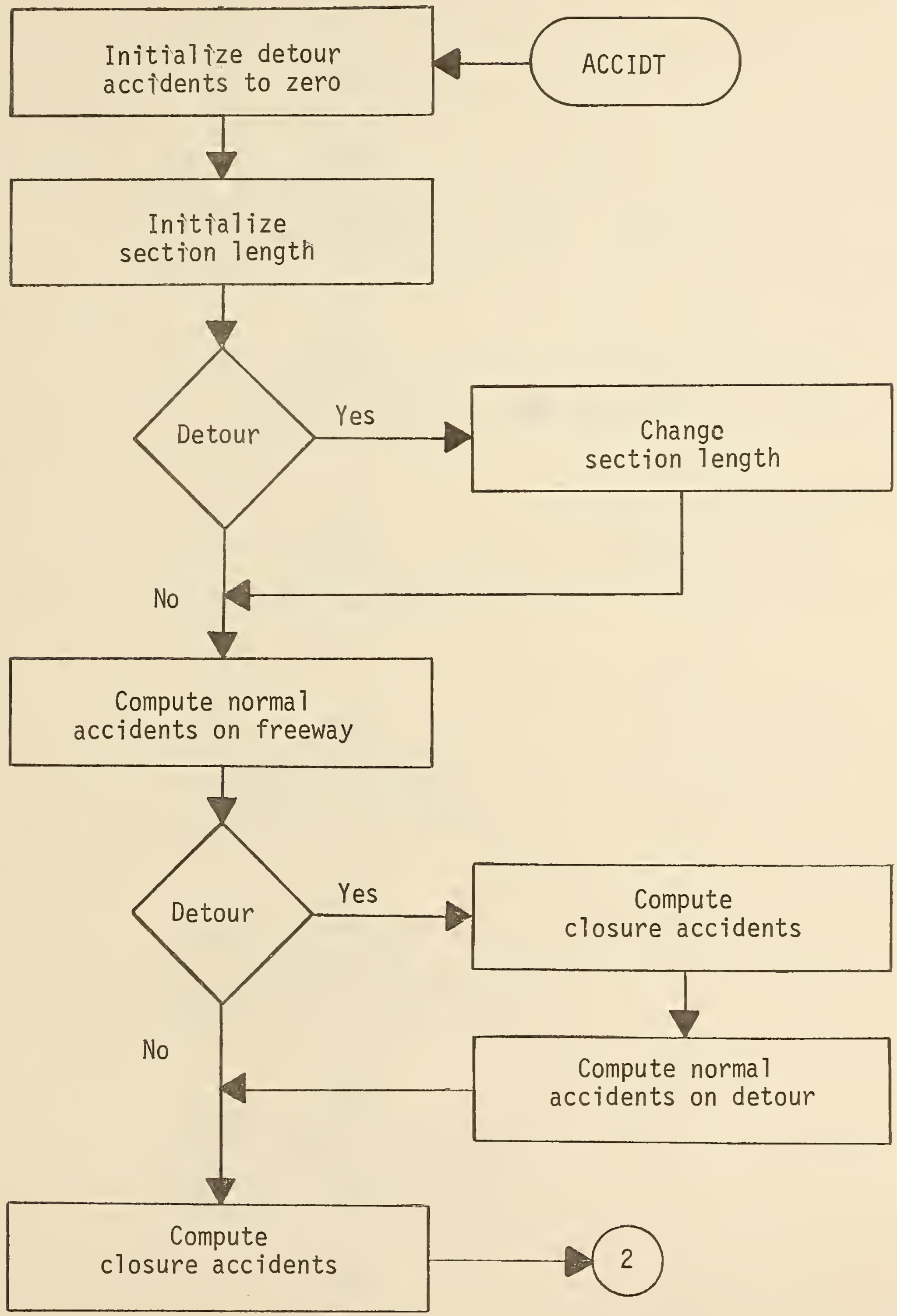
SCZ = Speed change zone length in miles

A = (-1.32 + .002 x DEC) x V x SCZ

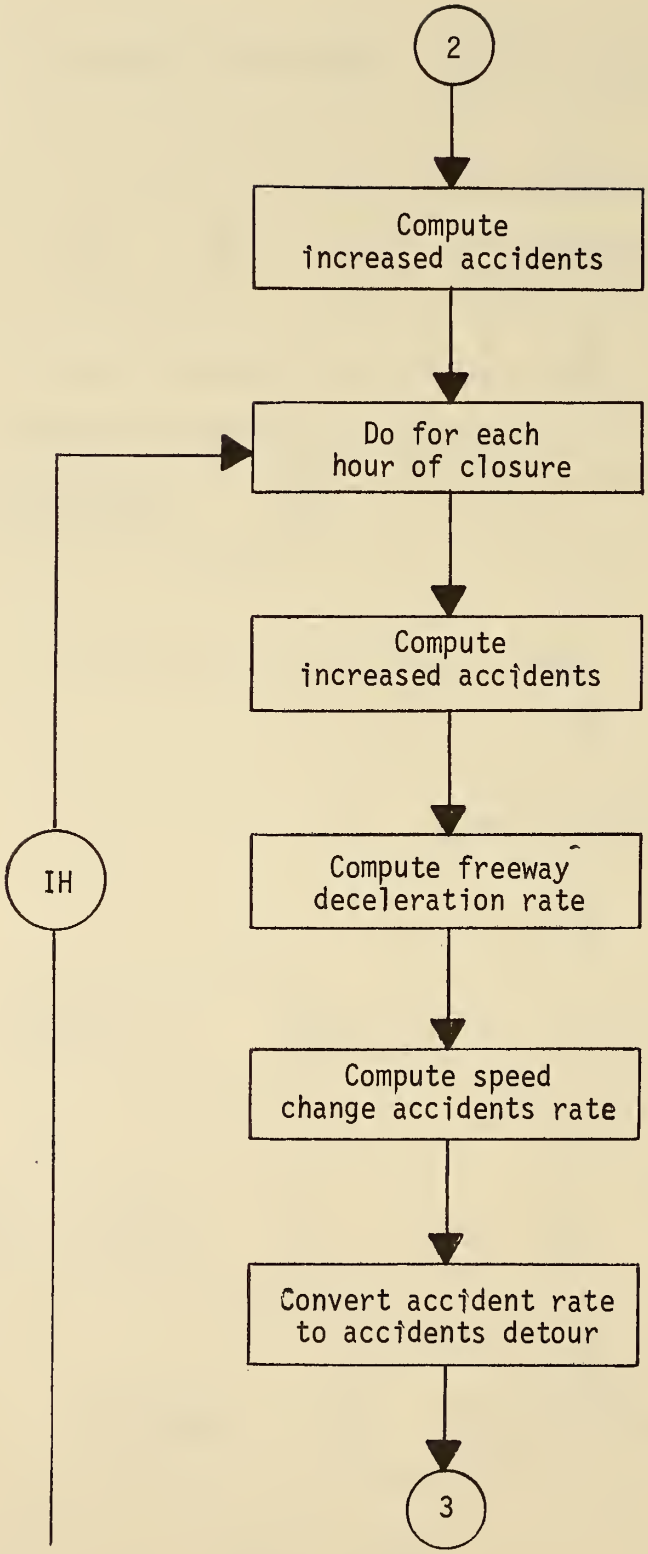
The accidents of both freeway motorists and detour motorists are computed using this model. These accidents are added to the increased accidents in the influence zone.

After the increased accidents have been accumulated for all lane closures the increased accident cost is computed by multiplying by the average cost of an accident.

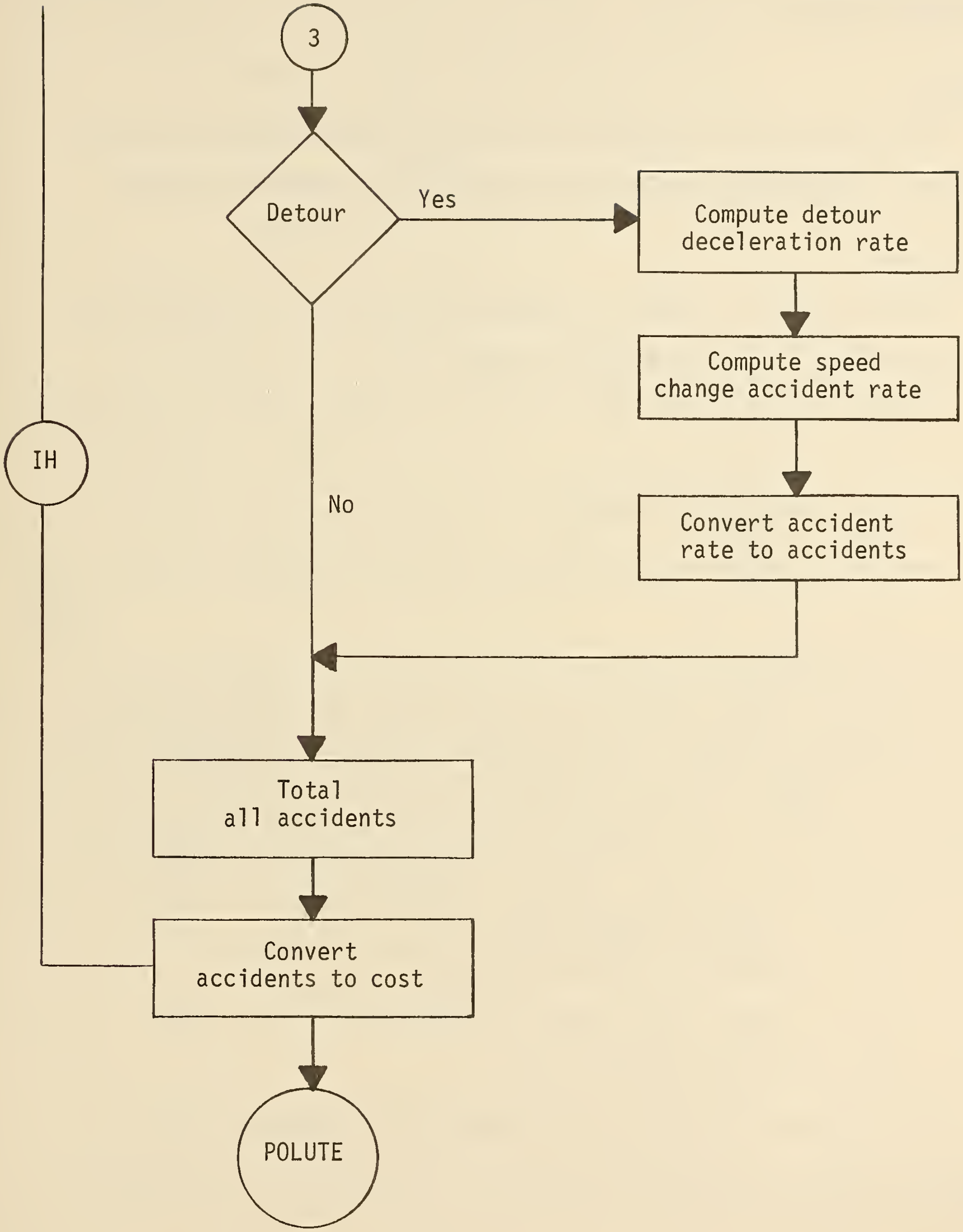
General Flow for Routine ACCIDT in Program 'EAROMAR'



ACCIDT cont'd.



ACCIDT cont'd.



SUBROUTINE MOTOR

ROUTINE: POLUTE

Purpose

This routine takes the speed, delay and volume data developed for each hour and computes a pollution impact due to roadway occupancy.

Description

The following two models are combined to produce a combined HC,CO pollution factor as a function of speed:

$$S = \text{Speed mph}$$

$$P = \text{Pollution factor}$$

$$P_{co} = .89e^{(1.193 - .032S)}$$

$$P_{hc} = .11e^{(.957 - .026S)}$$

$$P = P_{co} + P_{hc}$$

In each analysis hour a speed can be associated with normal operation on the freeway and detour; restricted operation on the freeway or detour due to traffic control, and with operations in a queue. The pollution rate for each condition is expressed by the following factors:

P_V = Normal freeway factor

P_r = Restricted operation factor

P_D = Normal detour operation factor

P_Q = Queue operation factor

The measure of the pollution increase due to traffic control is defined as days of additional pollution. This is based on the total pollution created by normal traffic operating on the project for one day. In each hour, the increased pollution is determined as follows:

V = Volume of traffic handled during hour

Z = Length of influence zone in miles

VMP = Increased vehicle miles of pollution at normal freeway levels

$$VMP = (P_r/P_v - 1) \times V \times Z$$

If the volume V has a queue time for the hour, then a similar computation is made to determine increased vehicle miles of pollution in the queue.

When the traffic is detoured, consideration is given to the different pollution emission rate associated with normal operation on the detour.

The increased vehicle miles of pollution are accumulated for each activity and closure category. The total is divided by the normal vehicle mile per day to produce increased days of pollution.

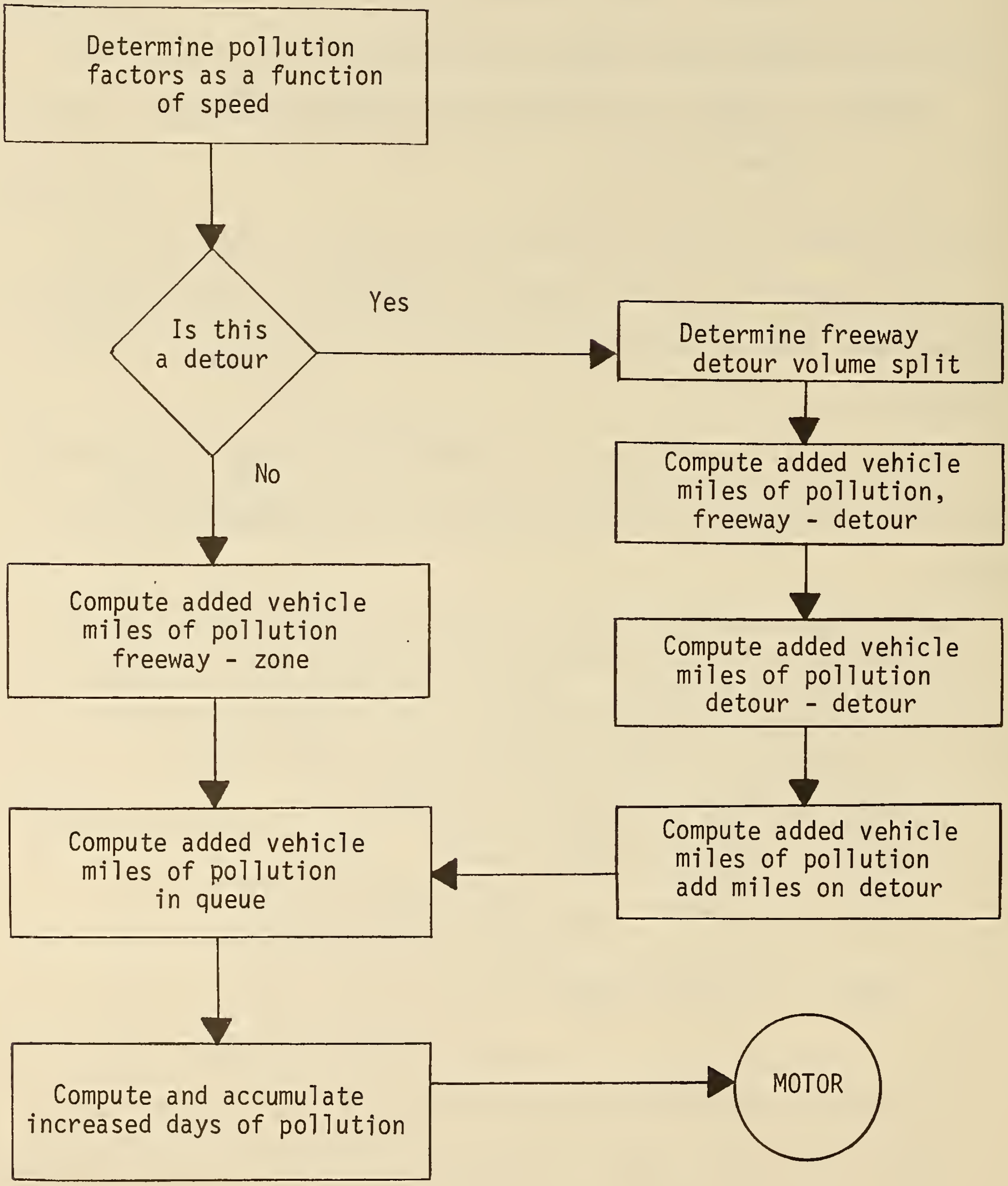
DAYS = Days of increased pollution

PROJ = Project length in miles

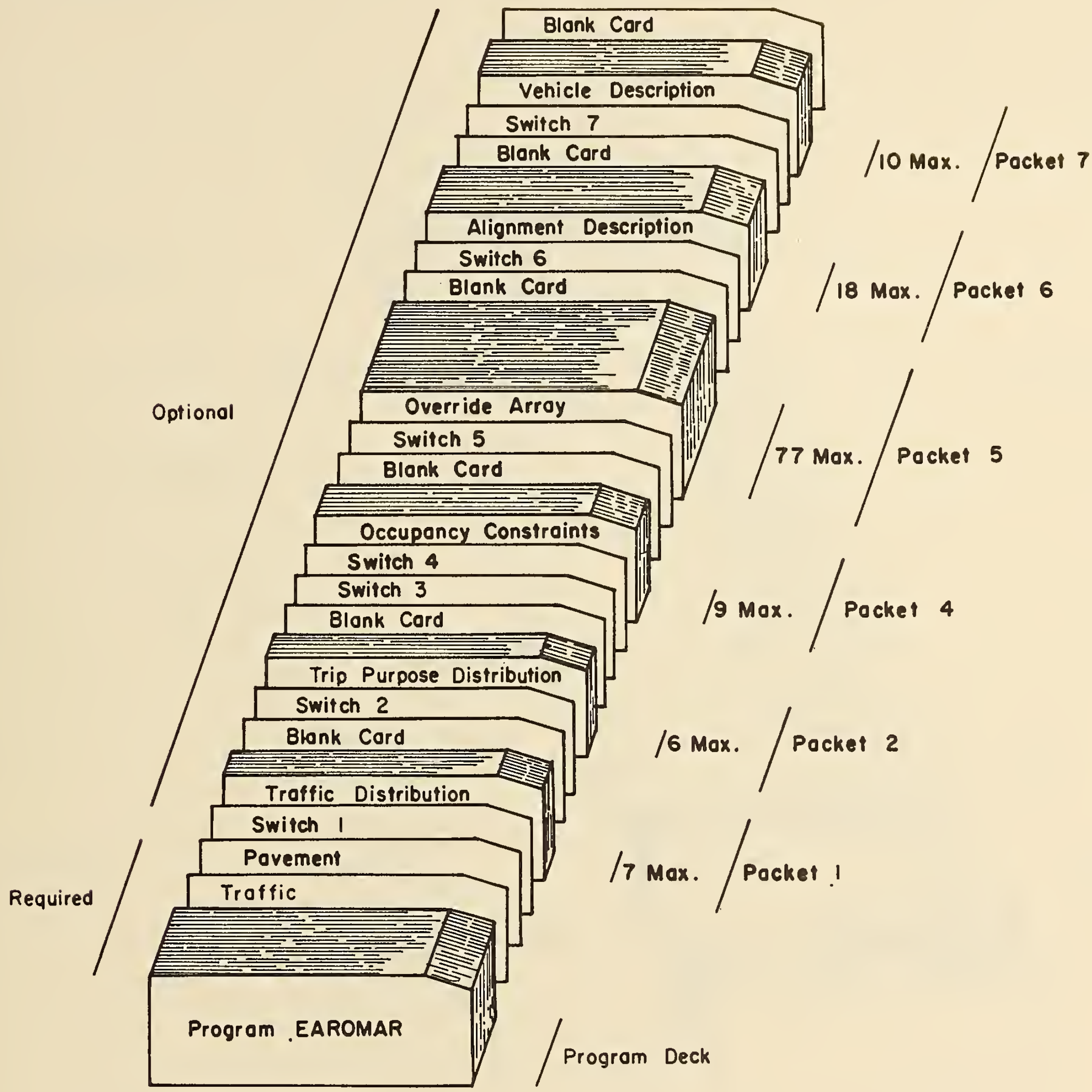
ADT = Freeway average daily traffic volume

$$DAYS = VMP/(PROJ \times ADT)$$

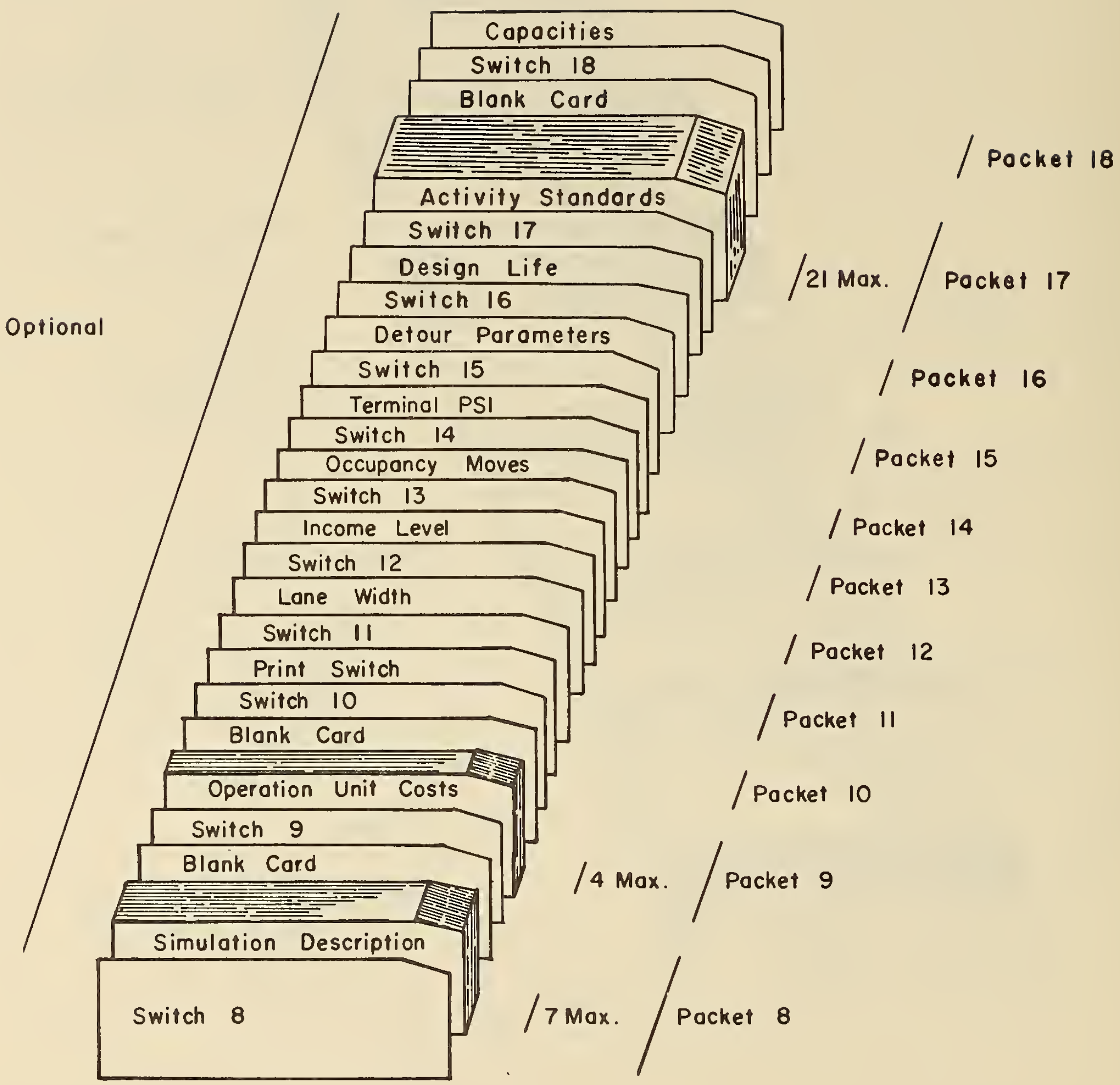
General Flow for Routine POLUTE in Program 'EAROMAR'



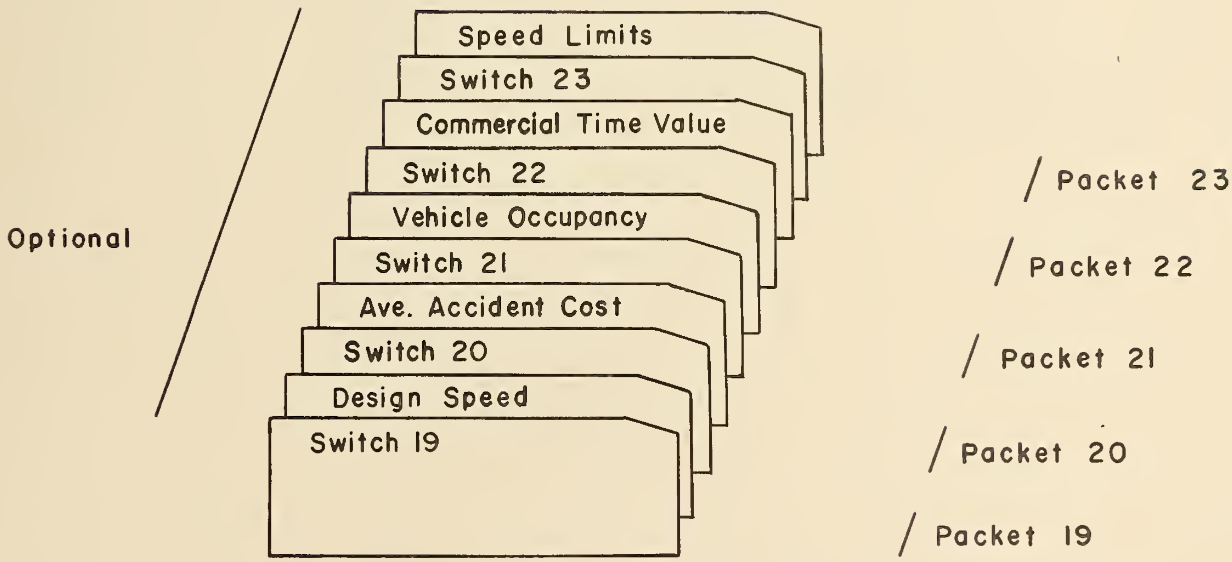
Input Format for Program 'EAROMAR'



Input cont'd.


Capacities
Switch 18
Blank Card
Packet 18
Activity Standards
Switch 17
Design Life
21 Max.
Packet 17
Switch 16
Optional
Detour Parameters
Switch 15
Packet 16
Terminal PSI
Switch 14
Packet 15
Occupancy Moves
Switch 13
Income Level
Packet 14
Switch 12
Packet 13
Lane Width
Switch 11
Packet 12
Print Switch
Switch 10
Packet 11
Blank Card
Operation Unit Costs
Packet 10
Switch 9
Blank Card
4 Max.
Packet 9
Simulation Description
Switch 8
7 Max.
Packet 8

Input cont'd


Optional
Speed Limits
Switch 23
Commercial Time Value
Switch 22
Vehicle Occupancy
Switch 21
Ave. Accident Cost
Switch 20
Design Speed
Switch 19
Packet 23
Packet 22
Packet 21
Packet 20
Packet 19

CARD NO. 1 -- TRAFFIC

FORMAT (6F5.2)

COLUMNS	INPUT VARIABLE	DESCRIPTION
1-5	VOLUME(1)	Initial Year Volume in 1000's
6-10	SPLIT(1)	Initial Year AM Split in percent
11-15	TRUCKS(1)	Initial Year Percentage of Commercial Vehicles
16-20	VOLUME(2)	Final Year Volume in 1000's
21-25	SPLIT(2)	Final Year AM Split in percent
26-30	TRUCKS(2)	Final Year Percentage of Commercial

CARD NO. 2 -- PAVEMENT

FORMAT (3I2,4F5.2)

COLUMNS	INPUT VARIABLE	DESCRIPTION
1-2	NYEARS	Number of years to be included in analysis
3-4	KP	Freeway type switch 1 = 4 lane 2 = 6 lane 3 = 8 lane
5-6	ITYPE	Pavement switch where 1 = Portland cement 2 = Bituminous 3 = Composite
7-11	PROJLN	Project length in miles
12-16	THICK1	Pavement surface thickness in inches
17-21	THICK2	Pavement base thickness in inches
22-26	THICK3	Pavement subgrade thickness in inches

CARD NO. 3 -- PACKET OPTION

FORMAT (I2,A4)

COLUMNS	INPUT VARIABLE	DESCRIPTION
1-2	IP	Packet Switch 1. Hourly volume distribution by trip purpose 2. Percent of total volume by trip purpose 3. Directional balancing switch 4. Permitted occupancy interval by activity 5. A range of override parameters by activity 6. Vertical and horizontal alignment 7. Vehicle classification data 8. Maintenance simulation parameters 9. Unit operating costs 10. Print switch 11. Pavement lane width 12. Income level 13. Speeds for walking and traveling on roadway 14. Terminal PSI value 15. Detour parameter 16. Design life 17. Activity standard 18. Capacities 19. Freeway design speed 20. Average accident cost 21. Vehicle occupancy 22. Commercial time value 23. Speed limits
3-6	END	The literal "bEND"

CARD NO. 4 -- TRAFFIC DISTRIBUTION

FORMAT (3I2,24F3.3)

MAXIMUM NUMBER OF CARDS - 7

VARIABLE OVERRIDE - PCTADT

COLUMNS	INPUT VARIABLE	DESCRIPTION
1-2	IT	Trip purpose switch 1 = Pass. Car Work Trips 2 = Pass. Car Personal Business Trips 3 = Pass. Car Social-Recreational Trips 4 = Pass. Car School Trips 5 = Pass. Car Vacation Trips 6 = Commercial Vehicle Trips 7 = All Trips
3-4	ID	Direction Switch 1 = AM peak direction 2 = PM peak direction
5-6	LEVEL	Volume level switch 1 = Initial year 2 = Final year

Decimal portion of 24 hourly volume for 100 percent of a given trip purpose

7-9	Z(1)	Hour 1
10-12	Z(2)	Hour 2
↓		↓
76-78	Z(24)	Hour 24

CARD NO. 5 - TRIP PURPOSE DISTRIBUTION

FORMAT (2I2, 6F3.3)

MAXIMUM NUMBER OF CARDS - 6
VARIABLE OVERRIDE - PERCNT

COLUMNS	INPUT VARIABLE	DESCRIPTION
1-2	ID	Direction Switch 1 = AM peak direction 2 = PM peak direction
3-4	LEVEL	Volume level switch 1 = Initial year 2 = Final year
5-7		Decimal portion of ALL trips that are:
	Z(1)	Work trips
8-10	Z(2)	Personal business trips
11-13	Z(3)	Social Recreation trips
14-16	Z(4)	School trips
17-19	Z(5)	Vacation trips
20-22	Z(6)	Commercial vehicle trips

CARD NO. 6 -- OCCUPANCY CONSTRAINTS

FORMAT (3I2)

MAXIMUM NUMBER OF CARDS - 9

VARIABLE OVERRIDE - INOCC

COLUMNS	INPUT VARIABLES	DESCRIPTION
1-2	INOCC (N,1) •	Activity No.
3-4	INOCC (N,2) •	First hour of occupancy
5-6	INOCC (N,3) •	Last hour of occupancy

CARD NO. 7 -- OVERRIDE ARRAY

FORMAT (2I2,F7.2)

MAXIMUM NUMBER OF CARDS - 7 x 12

VARIABLE OVERRIDE - OVER

COLUMNS	INPUT VARIABLE	DESCRIPTION
1-2	I1	Type Switch • 1 = Continuous crew work hours • 2 = Location or joint space in feet • 3 = Workload model factor • 4 = Workload model fixed annual rate • 5 = Travel time hours (round trip) •• 6 = Maintenance level • 7 = Cure time hours • 8 = Traffic control installation in hours • 9 = Max. workzone length in miles •10 = Vol/Cap Ratio allowed •11 = Min. workzone length •12 = Shoulder open to traffic
3-4	IA	Activity Number
5-11	VALUE	Value of Override

CARD NO. 8 -- ALIGNMENT DESCRIPTION

FORMAT (2I2, F7.2)

MAXIMUM NUMBER OF CARDS - 3 x 6

VARIABLE OVERRIDE - ALIGN

COLUMNS	INPUT VARIABLE	DESCRIPTION
1-2	I1	Alignment Switch 1 = Positive grades 2 = Negative grade 3 = Horizontal Curvature
3-4	I2	Alignment value from 1 to 6
5-11	VALUE	Mileage associated with Switch and Value

CARD NO. 9 -- VEHICLE DESCRIPTION

FORMAT (3F5.0)

MAXIMUM NUMBER OF CARDS -- 10

VARIABLE OVERRIDE - WEIGHT

COLUMNS	INPUT VARIABLE	DESCRIPTION
1-5	Z(1)	Weight in Kips
6-10	Z(2)	Percentage of vehicles in weight class
11-15	Z(3)	Initial cost of vehicles in weight class

NOTE: The first card in this group must always be the passenger car description if the option is exercised.

CARD NO. 10 -- SIMULATION DESCRIPTION

FORMAT (I2,5F10.2)

MAXIMUM NO. OF CARDS -- 7

VARIABLE OVERRIDE - SIM

COLUMNS	INPUT VARIABLE	DESCRIPTION
1-2	IA	Activity Number
3-12	Z(1)	Worksite Switch 1 = Full size patch 2 = Partial size patch 3 = Lanes closed
13-22	Z(2)	Worksite size multiplier factor
23-32	Z(3)	Worksite size add on constant
33-42	Z(4)	Number of simulation iterations
43-52	Z(5)	Worksite spacing switch 1 = Random spacing 2 = Uniform spacing

CARD NO. 11 -- OPERATION UNIT COSTS

FORMAT (I2,2F4.2)

MAXIMUM NUMBER OF CARDS -- 4

VARIABLE OVERRIDE - FUEL,TIRES,OIL,SINDEX

COLUMN	INPUT VARIABLE	DESCRIPTION
1-2	I1	Unit Switch 1 = Fuel 2 = Oil 3 = Tires 4 = Services Index
3-6	Z(1)	Unit Cost of Switch item for passenger cars
7-10	Z(2)	Unit cost of Switch item for all commercial vehicles (the composite commercial)

CARD NO. 12 -- PRINT SWITCH

FORMAT (2I2)

MAXIMUM NO. OF CARDS -- 1

VARIABLE OVERRIDE - IPRINT, JPRINT

COLUMNS	INPUT VARIABLE	DESCRIPTION
1-2	IPRINT	Print Switch 1 = Direction, Years, Year Total, Total 2 = Year, Year total, Total 3 = Year total, total 4 = Total
3-4	JPRINT	Print Switch 1 = Assumption, Matrices 2 = No Print

CARD NO. 13 -- LANE WIDTH

FORMAT (F5.2)

MAXIMUM NUMBER OF CARDS -- 1

VARIABLE OVERRIDE - WIDTH

COLUMN	INPUT VARIABLE	DESCRIPTION
1-5	WIDTH	Lane width in feet.

CARD NO. 14 -- INCOME

FORMAT (I2)

MAXIMUM NUMBER OF CARDS -- 1

VARIABLE OVERRIDE - INC

COLUMN	INPUT VARIABLE	DESCRIPTION
1-2	INC	Income level for value of time computation

CARD NO. 15 -- OCCUPANCY MOVES

FORMAT (2F5.2)

MAXIMUM NUMBER OF CARDS -- 1

VARIABLE OVERRIDE - WALK,TCMOVE

COLUMN	INPUT VARIABLE	DESCRIPTION
1-5	· WALK	Walking speed between worksites within a traffic control zone in mph
6-10	· TCMOVE	Travel speed between traffic control zones in mph.

CARD NO. 16 -- TERMINAL PSI

FORMAT (F5.2)

MAXIMUM NUMBER OF CARDS -- 1

VARIABLE OVERRIDE - PSIRS

COLUMN	INPUT VARIABLE	DESCRIPTION
1-5	· PSIRS	The value of the present serviceability index when resurfacing should occur

CARD NO. 17 -- DETOUR PARAMETERS

FORMAT (7F5.2)

MAXIMUM NUMBER OF CARDS - 1

VARIABLE OVERRIDE - DETOUR

COLUMN	INPUT VARIABLE	DESCRIPTION
1-4	DETOUR(1) ·	Distance between interchanges in miles
5-8	DETOUR(2) ·	Detour length in miles

9-12	DETOUR(3)	Average speed limit on detour with signals
13-16	DETOUR(4)	Normal detour volume ADT 1000's
17-20	DETOUR(5)	Detour capacity in 1000's
21-24	DETOUR(6)	Detour signal stops for all vehicles
25-28	DETOUR(7)	Directional lanes on detour

CARD NO. 18 -- DESIGN LIFE

FORMAT (2F5.2)

MAXIMUM NUMBER OF CARDS - 1

VARIABLE OVERRIDE - DLIFE, RLIFE

COLUMNS	INPUT VARIABLE	DESCRIPTION
1-5	DLIFE	Original pavement design life.
6-10	RLIFE	Resurfaced pavement design life.

CARD NO. 19 -- ACTIVITY STANDARD

FORMAT (2I2, 3F7.2)

MAXIMUM NUMBER OF CARDS - 3 x 7

VARIABLE OVERRIDE - PS

COLUMNS	INPUT VARIABLE	DESCRIPTION
1-2	IA	Activity Number
3-4	I1	PAVEMENT Switch 1 = PCC 2 = Bituminous 3 = Composite
5-11	S(1)	Crew Hourly Costs
12-18	S(2)	Material costs per workload unit.
19-25	S(3)	Production rate in workload units per hour.

CARD NO. 20 -- CAPACITIES

FORMAT (5F5.2)

MAXIMUM NUMBER OF CARDS - 5

VARIABLE OVERRIDE - CAP

COLUMNS	INPUT VARIABLE	DESCRIPTION
1-5	CAP(1) ·	Capacity of roadway with one lane closed.
6-10	CAP(2) ·	Capacity of roadway with two lanes closed.
11-15	CAP(3) ·	Capacity of roadway with three lanes closed.
16-20	CAP(4) ·	Capacity of roadway with four lanes closed.
21-25	CAP(*) ·	Capacity of roadway - no lanes closed

NOTE: If all lanes are closed, capacity shall be of the detour.

*Maximum Directional Lanes + 1

CARD NO. 21 -- FREEWAY DESIGN SPEED

FORMAT (F5.2)

MAXIMUM NUMBER OF CARDS - 1

VARIABLE OVERRIDE - DSPEED

COLUMNS	INPUT VARIABLE	DESCRIPTION
1-5	DSPEED·	Freeway design speed in m.p.h.

CARD NO. 22 -- AVERAGE ACCIDENT COST

FORMAT (F5.0)

MAXIMUM NUMBER OF CARDS - 1

VARIABLE OVERRIDE - AACOST

COLUMNS	INPUT VARIABLE	DESCRIPTION
1-5	AACOST	Average cost of an accident in dollars

CARD NO. 23 -- VEHICLE OCCUPANCY

FORMAT (2F5.2)

MAXIMUM NUMBER OF CARDS - 1

VARIABLE OVERRIDE - OCWORK, OCSCHL

COLUMNS	INPUT VARIABLE	DESCRIPTION
1-5	OCWORK	Occupancy per vehicle for work trips
6-10	OCSCHL	Occupancy per vehicle for school trips

CARD NO. 24 -- COMMERCIAL TIME VALUE

FORMAT (F5.2)

MAXIMUM NUMBER OF CARDS - 1

VARIABLE OVERRIDE - COMVOT

COLUMNS	INPUT VARIABLE	DESCRIPTION
1-5	COMVOT	The value of time per hour assigned to a composite commercial vehicle

CARD NO. 25 -- SPEED LIMITS

FORMAT (5F5.2)

MAXIMUM NUMBER OF CARDS - 1

VARIABLE OVERRIDE - SLIMIT

COLUMNS	INPUT VARIABLE	DESCRIPTION
1-5	SLIMIT(1)	Speed limit for freeway with one lane closed
6-10	SLIMIT(2)	Speed limit for freeway with two lanes closed
11-15	SLIMIT(3)	Speed limit for freeway with three lanes closed
16-20	SLIMIT(4)	Speed limit for freeway with four lanes closed
21-25	SLIMIT(*)	Speed limit of freeway with no lanes closed

*Maximum Directional Lanes + 1

APPENDIX A

Program Source Statements

```
C*******************************************************************************
C*******************************************************************************
C*******************************************************************************
C                      E C O N O M I C   A N A L Y S I S
C                                     O F
C                      R O A D W A Y   O C C U P A N C Y
C                                    F O R
C            M A I N T E N A N C E   A N D   R E C O N S T R U C T I O N
C*******************************************************************************
C*******************************************************************************
C*******************************************************************************
      INTEGER COSTS(7,5,8,2)
      COMMON          ARHO,            CAP(5),          COSTS,
     1 CWT,           DVOL(24),        HVOL(24),        ID,
     2 IHOUR(24,7),   ITYPE,           IY,              KP,
     3 LANES,         MI,              MO,              NYEARS,
     4 OCOSTS(65,2),  PATCHF(1000),    PATCHP(1000),    PROJLN,
     5 RLOC(1000),    SIM(7,5),        SP(5,11),        SPEEDD(24),
     6 SPEEDN(24),    SPLIT(2),        SWORK(7),        TRUCKS(2),
     7 VOLUME(2),     VTRATE(5,40),    ZONEL(7,4)
      COMMON/ASSUME/  ALIGN(3,6),      AACOST,          COMVOT,
     1 DETOUR(7),     DLIFE,           FUEL(2),         HRS(7,24,4),
     2 HWORK(7),      IDIR,            INC,             IPRINT,
     3 IWT,           JPRINT,          OCSCHL,          OCWORK,
     4 OIL(2),        OVER(12,7),      PCTADT(24,7,2,2),PS(7,3,3),
     5 PSIRS,         RATEI,           RLIFE,           SINDEX,
     6 SLIMIT(5),     TCMOVE,          TIRES(2),        TLEVEL(7),
     7 WALK,          WIDTH,           WEIGHT(10,3)
      MI=1
      MO=3
      CALL INITAL
      CALL OPPARA
      IF(JPRINT.NE.1)GOTO 100
      CALL RPRINT
  100 CONTINUE
      CALL YEAR
      STOP
      END
```

```
C
C*******************************************************************C
C*******************************************************************C
C*****************                                   **************C
C*****************       BLOCK        DATA           **************C
C*****************                                   **************C
C*****************       PROGRAM 'EARUMAR'           **************C
C*****************                                   **************C
C*******************************************************************C
C*******************************************************************C
C*******************************************************************C
C
      BLOCK DATA
      COMMON/ASSUME/    ALIGN(3,6),       AACOST,           COMVOT,
     1 DETOUR(7),       DLIFE,            FUEL(2),          HRS(7,24,4),
     2 HWORK(7),        IDIR,             INC,              IPRINT,
     3 IWT,             JPRINT,           OCSCHL,           OCWORK,
     4 OIL(2),          OVER(12,7),       PCTADT(24,7,2,2),PS(7,3,3),
     5 PSIRS,           RATEI,            RLIFE,            SINDEX,
     6 SLIMIT(5),       TCMOVE,           TIRES(2),         TLEVEL(7),
     7 WALK,            WIDTH,            WEIGHT(10,3)
C
C   ***ALIGNMENT MILEAGES,AVERAGE ACCIDENT COST,COMMERCIAL VALUE OF TIME
      DATA ALIGN,AACOST,COMVOT/18*0.0,850.0,8.72/
C
C   ***DETOUR PARAMETERS
      DATA DETOUR/2.0,2.6,45.0,20.0,2.4,0.8,2.0/
C
C   ***DESIGN LIFE, UNIT PRICE OF FUEL, OCCUPANCY HOURS
      DATA DLIFE,FUEL,HRS/20.0,0.4,0.3,672*0.0/
C
C   ***ANNUAL WORKLOAD, DIRECTION BALANCE INDEX, AVERAGE INCOME LEVEL,
C   ***ANALYSIS PRINT SWITCH
      DATA HWORK,IDIR,INC,IPRINT/7*0.0,0,4,1/
C
C   ***# VEHICLE CLASSES,INITIAL PRINT SWITCH, OCCUPANTS FOR SCHOOL & WORK TRIPS
      DATA IWT,JPRINT,OCSCHL,OCWORK/4,1,2.5,1.4/
C
C   ***UNIT PRICES OF OIL
      DATA OIL/0.8,0.4/
C
C   ***OVERRIDE PARAMETERS
      DATA OVER/9.0,50.0,1.0,0.0,0.5,1.0,3.0,.25,.5,1.0,.10,0.0,
     28.0,50.0,1.0,0.0,.5,1.0,1.0,.25,.5,1.0,.10,0.0,
     38.0,50.0,1.0,0.0,.5,1.0,1.0,.25,.5,10.0,.10,2.0,
     48.0,50.0,1.0,0.0,.5,0.2,1.0,.25,2.,1.0,.10,0.0,
     58.0,50.0,1.0,0.0,.5,1.0,1.0,.25,.5,1.0,0.1,0.0,
     68.0,50.0,1.0,0.0,.5,1.0,1.0,.25,.5,1.0,.10,0.0,
     712.0,1200.,1.0,0.0,0.5,0.0,0.0,.25,1.0,10.0,.25,0.0/
C
C   ***TRAFFIC DISTRIBUTIONS
      DATA PCTADT/.002,.000,.001,.011,.026,.074,.217,.190,.070,.046,
     A.041,
     B.043,.057,.053,.050,.035,.023,.017,.014,.008,.005,.008,.004,.005,
```

```
     C.037,.014,.005,.001,.000,.001,.004,.004,.005,.011,.018,.016,.017,
     D.024,.025,.032,.034,.038,.085,.182,.141,.117,.099,.090,.001,.000,
     E.000,.000,.000,.000,.001,.002,.006,.028,.073,.071,.049,.062,.073,
     F.068,.080,.090,.104,.141,.100,.039,.010,.002,.045,.046,.029,.029,
     G.009,.008,.015,.031,.050,.056,.055,.050,.051,.050,.043,.037,.036,
     H.055,.057,.057,.055,.050,.045,.041,.000,.000,.000,.000,.000,.000,
     I.004,.173,.323,.104,.031,.013,.036,.019,.025,.010,.016,.065,.098,
     J.052,.028,.010,.000,.002,.013,.013,.012,.012,.017,.028,.053,.069,
     K.066,.062,.060,.060,.056,.060,.062,.070,.074,.063,.041,.031,.022,
     L.020,.021,.015,24*.0,.019,.006,.004,.002,.001,.001,.003,.006,.013,
     M.004,.005,.013,.024,.014,.020,.052,.288,.299,.105,.034,.019,.029,
     N.018,.021,72*.0,.004,.002,.001,.000,.000,.000,.000,.000,.006,.007,
     O.016,.024,.085,.039,.063,.181,.098,.105,.036,.039,.092,.108,.071,
     P.023,384*.0/
C
C   ***ACTIVITY STANDARDS
      DATA PS/48.40,31.92,48.98,26.62,35.91,0.0,0.0,
     155.83,28.98,69.42,0.0,0.0,0.0,0.0,
     255.83,0.0,48.98,28.98,35.91,0.0,0.0,
     36.25,0.20,86.40,.075,.70,0.0,1.2,
     4.50,.10,5.07,0.0,0.0,0.0,1.2,
     5.50,0.0,86.40,.10,.70,0.0,1.20,
     611.1,5.0,.5,280.0,30.0,0.0,700.0,
     7180.0,1500.0,5.6,0.0,0.0,0.0,700.0,
     8180.0,0.0,0.5,1500.0,30.0,0.0,700.0/
C
C   ***RESURFACING PSI,INTEREST RATE,RESURFACED LIFE, SERVICES INDEX
      DATA PSIRS,RATEI,RLIFE,SINDEX/2.0,.08,10.0,1.5/
C
C   ***SPEED LIMITS,TRAVEL SPEED BETWEEN ZONES, UNIT PRICES OF TIRES,
C   ***ACCUMULATED MAINTENANCE LEVELS
      DATA SLIMIT,TCMOVE,TIRES,TLEVEL/4*50.0,60.0,20.0,0.1,0.2,7*0.0/
C
C   ***TRAVEL SPEED WITHIN ZONE, LANE WIDTH
      DATA WALK,WIDTH/2.0,12.0/
C
C   ***VEHICLE PARAMETERS
      DATA WEIGHT/4.2,15.4,39.8,53.6,6*0.0,93.1,2.9,2.2,2.8,6*0.0,
     13000.0,7300.0,24400.0,39300.0,6*0.0/
      END
```

```
C
C********************************************************************C
C********************************************************************C
C******************                                  ***************C
C******************         SUBROUTINE INITIAL       ***************C
C******************                                  ***************C
C******************         PROGRAM 'EARUMAR'        ***************C
C******************                                  ***************C
C********************************************************************C
C********************************************************************C
C********************************************************************C
C
      SUBROUTINE INITAL
      INTEGER COSTS(7,5,8,2)
      COMMON           ARHO,            CAP(5),          COSTS,
     1 CWT,            DVOL(24),        HVOL(24),        ID,
     2 IHOUR(24,7),    ITYPE,           IY,              KP,
     3 LANES,          MI,              MO,              NYEARS,
     4 OCOSTS(65,2),   PATCHF(1000),    PATCHP(1000),    PROJLN,
     5 RLOC(1000),     SIM(7,5),        SP(5,11),        SPEEDD(24),
     6 SPEEDN(24),     SPLIT(2),        SWORK(7),        TRUCKS(2),
     7 VOLUME(2),      VTRATE(5,40),    ZONEL(7,4)
      COMMON/ASSUME/   ALIGN(3,6),      AACOST,          COMVOT,
     1 DETOUR(7),      DLIFE,           FUEL(2),         HRS(7,24,4),
     2 HWORK(7),       IDIR,            INC,             IPRINT,
     3 IWT,            JPRINT,          OCSCHL,          OCWORK,
     4 OIL(2),         OVER(12,7),      PCTADT(24,7,2,2),PS(7,3,3),
     5 PSIRS,          RATEI,           RLIFE,           SINDEX,
     6 SLIMIT(5),      TCMOVE,          TIRES(2),        TLEVEL(7),
     7 WALK,           WIDTH,           WEIGHT(10,3)
      DIMENSION CCAP(5,3)
      DIMENSION INOCC(10,3),IBAL(7,2,2),Z(24),SSIM(7,3,5)
      DIMENSION RANDOM(2),PERCNT(6,2,2)
C
C  ***END OF DATA TEST VARIABLE
      DATA ENDVER/' END'/

C  ***CAPACTIES BY EXPRESSWAY TYPE AND CLUSURE
      DATA CCAP/1.7,.8,4.,0.0,0.0,3.8,1.7,.8,6.,0.0,5.7,3.8,1.7,.8,8./
C
C  ***DESIGN SPEED
      DATA DSPEED/70./
C
C  ***TRAFFIC DISTRIBUTIONS BALANCING INDICES
      DATA IBAL/28*0/
C
C  ***ALLOWABLE OCCUPANCY INTERVAL
      DATA INOCC/30*0/
      INOCC(10,1)=10
      INOCC(10,2)=7
      INOCC(10,3)=18
      INOCC(9,1)=3
      INOCC(9,2)=15
      INOCC(9,3)=18
```

```
C
C   ***DEFAULT VALUES FOR THE SIMULATION PROCESS FOR THREE PAVEMENT TYPES
      DATA SSIM/1.,2.,1.,3.,2.,1.,3.,1.,3.,1.,3.,3.,3.,3.,1.,3.,1.,
     13.,2.,3.,3.,1.,1.,0.,12.,3.,10.,1500.,1.,12.,.1,0.,0.,0.,1500.,
     210.,0.,0.,12.,3.,0.,1500.,0.,0.,1.,0.,10.,0.,0.,0.,0.,0.,0.,0.,
     30.,0.,0.,0.,1.,0.,10.,0.,0.,100.0,100.0,1.,250.0,100.,100.0,10.,
     4100.0,250.0,100.,1.,1.,1.,10.,100.0,1.,1.,250.0,100.,1.,10.,1.,1.,
     51.,2.,1.,1.,2.,1.,1.,1.,1.,1.,1.,2.,1.,1.,1.,2.,1.,1.,2./
C
C   ***TRAFFIC DISTRIBUTION BETWEEN TRIP PURPOSES
      DATA PERCNT/.331,.189,.284,.001,.095,.100,
     1.331,.189,.284,.001,.095,.100,
     2.331,.189,.284,.001,.095,.100,
     3.331,.189,.284,.001,.095,.100/
    1 FORMAT(I2,A4)
    2 FORMAT(3I2,24F3.3)
    3 FORMAT(2I2,3F7.2)
    4 FORMAT(2I2,6F3.3)
    5 FORMAT(3F5.0)
    6 FORMAT(I2,5F10.2)
    7 FORMAT(I2,2F4.2)
    8 FORMAT(8F5.2)
    9 FORMAT(3I2,4F5.2)
C
C
C   ***INPUT INITIAL AND FINAL ANALYSIS YEAR VOLUME,AM PEAK SPLIT AND % TRUCKS
      READ(MI,8)(VOLUME(J),SPLIT(J),TRUCKS(J),J=1,2)
C
C   ***INPUT ANALYSIS YEARS,PAVEMENT TYPE,PROJECT LENGTH IN MILES, AND PAVEMENT
C   ***THICKNESS FOR SURFACE,BASE AND SUBGRADE
C   ***               PAVEMENT TYPES
C   ***               1. CONCRETE
C   ***               2. BITUMINOUS
C   ***               3. COMPOSITE
C
      READ(MI,9)NYEARS,KP,ITYPE,PROJLN,THICK1,THICK2,THICK3
      LANES=KP+1
C
C   ***ESTABLISHMENT OF THE DEFAULT OPTION FOR WORKSITE SIMULATION GIVEN ITYPE
      DO 1050 IA=1,7
      DO 1051 J=1,5
 1051 SIM(IA,J)=SSIM(IA,ITYPE,J)
 1050 CONTINUE
C
C   ***ESTABLISH DEFALUT OPTION FOR CAPACITY
      DO 1060 J=1,5
      CAP(J)=CCAP(J,KP)
 1060 CONTINUE
C
C
C
C   ***INITIALIZE REMAINDER OF TRAFFIC DISTRIBUTIONS
C
 1000 CONTINUE
```

```
      DO 1010 IT=1,6
C
C***  TEST FOR DIRECTIONS 1&2 IDENTICAL
      GOTO(1032,1020,1020,1020,1032,1020),IT
 1020 CONTINUE
C
C***  INITIALIZE DIRECTION 2
      DO 1030 IH=1,24
      PCTADT(IH,IT,2,1)=PCTADT(IH,IT,1,1)
 1030 CONTINUE
 1032 CONTINUE
C
C***  INITIALIZE FINAL VOLUME DISTRIBUTIONS
      DO 1031 IH=1,24
      PCTADT(IH,IT,1,2)=PCTADT(IH,IT,1,1)
      PCTADT(IH,IT,2,2)=PCTADT(IH,IT,2,1)
 1031 CONTINUE
 1010 CONTINUE
C
C***  DETERMINATION OF AN AASHO BASED ANNUAL 18 KIP AXLES FACTOR
      GOTO(1100,1101,1101), ITYPE
C
C***  AASHO BASED ACCUMULATED 18 KIP AXLES TO 1.5 PSI AS A FUNCTION THICKNESS
 1100 RHO=.88*(THICK1+1)**7.35
      GOTO 1102
C
C***  AASHO THICKNESS FACTOR FOR BITUMINOUS PAVEMENTS
 1101 THICK=.44*THICK1+.14*THICK2+.1*THICK3
C
C***  AASHO BASED ACCUMULATED 18 KIP AXLES TO 1.5 PSI AS A FUNCTION THICKNESS
      RHO=2.26*(THICK+1)**8.94
 1102 ARHO=RHO/20000000
 1105 CONTINUE
C
C***  READ TYPE OF OVERRIDE OR END OF OVERRRIDES
 1200 READ(MI,1)IP,END
C
C***  TEST FOR END OF OVERRIDE DATA
      IF(END.EQ.ENOVER)GOTO 1299
C
C***  GO TO PROPER OVERRIDE ROUTINE
C***  THE OVERRIDE SWITCHES ARE SUMMARIZED AS FOLLOWS:
C***                    1. HOURLY VOLUME DISTRIBUTION BY TRIP PURPOSE
C***                    2. PERCENT OF TOTAL VOLUME BY TRIP PURPOSE
C***                    3. DIRECTIONAL BALANCING SWITCH
C***                    4. PERMITTED OCCUPANCY INTERVAL BY ACTIVITY
C***                    5. A RANGE OF OVERRIDE PARAMETERS BY ACTIVITY
C***                    6. VERTICAL AND HORZONTAL ALIGNMENT
C***                    7. VEHICLE CLASSIFIACTION DATA
C***                    8. MAINTENANCE SIMULATION PARAMETERS
C***                    9. UNIT OPERATING COSTS
C***                   10. PRINT SWITCH
C***                   11. PAVEMENT LANE WIDTH
C***                   12. INCOME LEVEL
```

```
C***                 13. SPEEDS FOR WALKING AND TRAVELING ON ROADWAY BY MAINT. CREW
C***                 14. TERMINAL PSI VALUE
C***                 15. DETOUR PARAMETERS
C***                 16. DESIGN LIFE
C***                 17. ACTIVITY STANDARD
C***                 18. CLOSURE CAPACITIES
C***                 19. FREEWAY DESIGN SPEED
C***                 20. AVERAGE ACCIDENT COSTS
C***                 21. VEHICLE OCCUPANCY
C***                 22. COMMERCIAL VALUE OF TIME
C***                 23. SPEED LIMITS
C
      GOTO(1201,1203,1205,1206,1208,1209,1210,1212,1220,1225,1226),IP
      IP=IP-11
      GOTO(1227,1228,1229,1230,1231,1232,1234,1235,1236,1237,1238),IP
      IP=IP-11
      GOTO(1239),IP
C
C  *****  PACKET NUMBER  1
C
C***  READ TRIP PURPOSE, DIRECTION, VOLUME LEVEL,& HOURLY DISTRIBUTION
C  ***SWITCHES FOR TRIP PURPOSE
C  ***               1. WORK TRIPS
C  ***               2. PERSONAL BUSINESS TRIPS
C  ***               3. SOCIAL-RECREATIONAL TRIPS
C  ***               4. SCHOOL TRIPS
C  ***               5. VACATION TRIPS
C  ***               6. COMMERCIAL TRIPS
 1201 READ(MI,2)IT,ID,LEVEL,(Z(I),I=1,24)
C
C***  TEST FOR END OF HOURLY DISTRIBUTION OVERRIDE
      IF(IT.EQ.0)GOTO 1200
C
C***  SET INDEX TO INDICATE OVERRIDDEN DISTRIBUTIONS
      IBAL(IT,ID,LEVEL)=1
C
C***  REPLACE OLD WITH NEW DISTRIBUTION
      DO 1202 I=1,24
      PCTADT(I,IT,ID,LEVEL)=Z(I)
 1202 CONTINUE
C
C***  GET NEXT HOURLY DISTRIBUTION
      GOTO 1201
C
C  *****  PACKET NUMBER  2
C
C***  READ DIRECTION, VOLUME LEVEL,& TRIP PURPOSE DISTRIBUTION
 1203 READ(MI,4)ID,LEVEL,(Z(I),I=1,6)
C
C***  TEST FOR END OF TRIP PURPOSE DISTRIBUTIONS OVERRIDES
      IF(ID.EQ.0)GOTO 1200
C
C***  REPLACE OLD WITH NEW TRIP PURPOSE DISTRIBUTION
      DO 1204 I=1,6
```

```
      PERCNT(I,ID,LEVEL)=Z(I)
 1204 CONTINUE
C
C***  GET NEXT TRIP PURPOSE DISTRIBUTION OVERRIDE
      GOTO 1203
C
C  *****  PACKET NUMBER  3
C
C***  SET INDICATOR TO COMBINE AM & PM PEAKS
 1205 IDIR=3
      GOTO 1200
C
C  *****  PACKET NUMBER  4
 1206 CONTINUE
      DO 1207 I=1,9
C
C***  OVERRIDE ALLOWED OCCUPANCY HOURS
C
C***  READ ACTIVITY NUMBER, START TIME, FINISH TIME
      READ(MI,2)(INOCC(I,J),J=1,3)
C
C  ***IF OCCUMPANCY TIME FOR ALL ACTIVITIES IS INPUT,'INOCC(I,1)=10' THEN
C  ***THE DEFALT OPTION IS OVERRIDEN
      IF(INOCC(I,1).EQ.10)INOCC(10,1)=0
C
C***  TEST FOR END OF OCCUPANCY HOURS OVERRIDES
      IF(INOCC(I,1).EQ.0)GOTO 1200
C
C***  GET NEXT OCCUPANCY HOUR OVERRIDE
 1207 CONTINUE
C
C***  DUMMY READ OF BLANK CARD FOLLOWING NINE OVERRIDES
      READ(MI,1)I1
C
C***  GET NEXT TYPE OF OVERRIDE
      GOTO 1200
C
C  *****  PACKET NUMBER  5
C
C***  READ OVER TYPE, ACTIVITY, AND VALUE
C  ***SWITCHES FOR OVERRIDE PARAMETERS
C  ***             1. CONTINOUS CREW WORK HOURS
C  ***             2. LOCATION OR JOINT SPACING
C  ***             3. WORKLOAD MODEL FACTOR
C  ***             4. WORKLOAD MODEL FIXED ANNUAL RATE
C  ***             5. TRAVEL TIME HOURS
C  ***             6. MAINTENANCE LEVEL
C  ***             7. CURE TIME IN HOURS
C  ***             8. TRAFFIC CONTROL INSTALLATION TIME IN HOURS
C  ***             9. MAXIMUM TRAFFIC CONTROL ZONE LENGTH IN MILES
C  ***            10. VOLUME/CAPACITY RATIO ALLOWED
C  ***            11. MINIMUM TRAFFIC CONTROL LENGTH IN MILES
C  ***            12. SHOULDERS OPEN
 1208 READ(MI,3)I1,IA,VALUE
```

```
C
C***  TEST FOR END OF OVER OVERRIDES
      IF(I1.EQ.0)GOTO 1200
C
C***  REPLACE ASSUMED VALUE WITH OVERRIDE VALUE
      OVER(I1,IA)=VALUE
C
C***  GET NEXT OVER OVERRIDE
      GOTO 1208
C  *****  PACKET NUMBER  6
C
C
C  ***DESIGN ALIGNMENT,VERTICAL AND HORIZONTAL
 1209 CONTINUE
C
C  ***READ ALIGNMENT TYPE'+GRADE,-GRADE,DEGREES',MAGNITUDE AND MILEAGE
      READ(MI,3)I1,I2,VALUE
C
C  ***TEST FOR END OF OVERRIDE
      IF(I1.EQ.0)GOTO 1200
C
C  ***REPLACE ASSUMED VALUE WITH OVERRIDE VALUE
      ALIGN(I1,I2)=VALUE
C
C  ***GET NEXT OVERRIDE
      GOTO 1209
C
C  ***READ VEHICLE WEIGHT, PERCENTAGE AND COSTS, NOTE THAT FIRST CARD
C  ***MUST BE PASSENGER VEHICLES
C
C  *****  PACKET NUMBER  7
 1210 IWT=0
 1211 READ(MI,5)(Z(J),J=1,3)
C
C  ***TEST FOR END OF OVERRIDE
      IF(Z(1).EQ.0)GOTO 1200
      IWT=IWT+1
      WEIGHT(IWT,1)=Z(1)
      WEIGHT(IWT,2)=Z(2)/100
      WEIGHT(IWT,3)=Z(3)
      GOTO 1211
C
C  *****  PACKET NUMBER  8
C
C  ***READ ACTIVITY AND SIMULATION PARAMETERS
C  ***               1. WORKSITE TYPE
C  ***               2. WORKSITE FACTOR
C  ***               3. ADD ON VALUE
C  ***               4. NUMBER OF ITERATIONS
C  ***               5. RANDOM OR UNIFORM LOCATIONS
 1212 CONTINUE
      READ(MI,6)IA,(Z(J),J=1,5)
C
C  ***TEST FOR END OF OVERRIDE
```

```
C
      IF(IA.EQ.0)GOTO 1200
      DO 1213 I=1,5
 1213 SIM(IA,I)=Z(I)
      GOTO 1212
C
C   *****  PACKET NUMBER  9
 1220 READ(MI,7)I1,(Z(J),J=1,2)
      IF(I1.EQ.0)GOTO 1200
      GOTO(1221,1222,1223,1224),I1
 1221 FUEL(1)=Z(1)
      FUEL(2)=Z(2)
      GOTO 1220
 1222 TIRES(1)=Z(1)
      TIRES(2)=Z(2)
      GOTO 1220
 1223 OIL(1)=Z(1)
      OIL(2)=Z(2)
      GOTO 1220
 1224 SINDEX=Z(1)
      GOTO 1220
C
C   *****  PACKET NUMBER 10
 1225 READ(MI,3)IPRINT,JPRINT
      GOTO 1200
C
C   *****  PACKET NUMBER 11
 1226 READ(MI,8)WIDTH
      GOTO 1200
C
C   *****  PACKET NUMBER 12
 1227 READ(MI,1)INC
      GOTO 1200
C
C   *****  PACKET NUMBER 13
 1228 READ(MI,8)WALK,TCMOVE
      GOTO 1200
C
C   *****  PACKET NUMBER 14
 1229 READ(MI,8)PSIRS
      GOTO 1200
C
C   *****  PACKET NUMBER 15
 1230 READ(MI,8)(DETOUR(J),J=1,7)
      GOTO 1200
C
C   *****  PACKET NUMBER 16
 1231 READ(MI,8)DLIFE,RLIFE
      GOTO 1200
C
C   *****  PACKET NUMBER 17
 1232 READ(MI,3)IA,I1,(Z(J),J=1,3)
      IF(IA.EQ.0)GOTO 1200
      DO 1233 J=1,3
```

```
      PS(IA,I1,J)=Z(J)
 1233 CONTINUE
      GOTO 1232
C
C  *****  PACKET NUMBER 18
 1234 READ(MI,8)(CAP(J),J=1,5)
      GOTO 1200
C
C  *****  PACKET NUMBER 19
 1235 READ(MI,8)DSPEED
      GOTO 1200
C
C  *****  PACKET NUMBER 20
 1236 READ(MI,5)AACOST
      GOTO 1200
C
C  *****  PACKET NUMBER 21
 1237 READ(MI,8)OCWORK,OCSCHL
      GOTO 1200
C
C  *****  PACKET NUMBER 22
 1238 READ(MI,8)COMVOT
      GOTO 1200
C
C  *****  PACKET NUMBER 23
 1239 READ(MI,8)(SLIMIT(J),J=1,5)
      GOTO 1200
 1299 CONTINUE
C
C
C
C  ***ARRAYS ARE ESTABLISHED FOR FULL DEPTH AND PARTIAL DEPTH PATCH SIZES
C  ***AND RANDOM LOCATIONS ALONG THE ROADWAY
C
C
C
C
C***  INITIALIZE NY AN ODD NUMBER AND N1,N2,N3, COUNTERS FOR PATCH ARRAYS
      NY=7
      N1=0
      N2=0
      N3=0
C
C***  DETERMINE PFACT, A FACTOR TO CONVERT F.D. PATCH LENGTHS TO AREA IN SQ.YDS.
      PFACT=WIDTH/9
C
C***  TEST FOR PAVEMENT TYPE
      IF(ITYPE.EQ.1)GOTO 106
C
C***  IF THE PAVEMENT IS BITUMINOUS THE ARRAY IS FACTORED BY TEN AND
      PFACT=PFACT*10
  106 CONTINUE
C
C***  TWO RANDOM NUMBERS ARE GENERATED FOR TESTING AGAINST DISTRIBUTION
```

```
      DO 110 I1=1,10
      IF(N1.EQ.1000.AND.N2.EQ.1000)GOTO 111
      DO 101 I=1,1000
      DO 104 J=1,2
      NY=NY*65539
      IF(NY)102,104,104
  102 NY=NY+2147483647+1
  104 RANDOM(J)=NY*.4656613E-9
C
C***  THE FIRST RANDOM NUMBER IS CONVERTED TO A FULL DEPTH CONCRETE
C***  PATCH LENGTH AND TO A PARTIAL DEPTH PATCH AREA
      XF=RANDOM(1)*50
      XP=RANDOM(1)*40
C
C***  ONCE ANY COUNTER REACHES 1000 THE ARRAY HAS BEEN FILLED
      IF(N1.EQ.1000)GOTO 103
C
C***  THE FULL DEPTH PATCH LENGTH IS ASSIGNED TO THE DENSITY FUNCTION
C***  FOR FULL DEPTH PATCH SIZES AND THE RESULTING NUMBER IS TESTED
C***  AGAINST THE SECOND RANDOM NUMBER
      YD=(.186E-3)*((.75*XF)**8)*(EXP(-.75*XF))
      IF(RANDOM(2).GT.YD)GOTO 103
C
C***  THE ACCEPTED PATCH IS PLACED IN AN ARRAY
      N1=N1+1
      PATCHF(N1)=XF*PFACT
C
C
C***  ONCE ANY COUNTER REACHES 1000 THE ARRAY HAS BEEN FILLED
  103 IF(N2.EQ.1000)GOTO 108
C
C***  THE PARTIAL DEPTH PATCH AREA IS ASSIGNED TO THE DENSITY FUNCTION
C***  FOR PARTIAL DEPTH PATCH SIZES AND THE RESULTING NUMBER IS TESTED
C***  AGAINST THE SECOND RANDOM NUMBER
      YD=1.47*XP*EXP(-.6*XP)+.1
      IF(RANDOM(2).GT.YD)GOTO 108
C
C***  PARTIAL DEPTH PATCH CANNOT BE SMALLER THAN 1/2 SQ. FT.
      IF(XP.LT.0.5)GOTO 108
C
C***  THE ACCEPTED PATCH IS PLACED IN AN ARRAY
      N2=N2+1
      PATCHP(N2)=XP
C
C***  ONCE ANY COUNTER REACHES 1000 THE ARRAY HAS BEEN FILLED
  108 IF(N3.EQ.1000)GOTO 101
C
C***  THE SECOND RANDOM NUMBER IS ASSIGNED TO A RANDOM NUMBER ARRAY
      N3=N3+1
      RLOC(N3)=RANDOM(2)
  101 CONTINUE
  110 CONTINUE
  111 CONTINUE
C
```

```
C***  THE RANDOM NUMBER ARRAY IS SORTED IN ASCENDING ORDER
      DO 105 I=1,999
      N=I+1
      DO 107 J=N,1000
      IF(RLOC(J).GT.RLOC(I))GOTO 107
      TEMP1=RLOC(I)
      RLOC(I)=RLOC(J)
      RLOC(J)=TEMP1
  107 CONTINUE
  105 CONTINUE
C
C
C  ***COMPUTE THE SIMULATION WORKLOAD TO BE ASSOCIATED WITH EACH ACTIVITY
      DO 120 IA=1,7
C
C  ***DETERMINE THE TYPE OF WORKSITE,FULL DEPTH, PARTIAL DEPTH, LANE
      J=SIM(IA,1)
C
C  ***DETERMINE THE NUMBER OF ITERATIONS
      N=SIM(IA,4)
C
C  ***INITIALIZE THE HOLD FOR THE SIMULATION WORKLOAD
      SWORK(IA)=0
      DO 121 IW=1,N
      GOTO(130,131,132),J
  130 TEMP1=PATCHF(IW)
      GOTO 133
  131 TEMP1=PATCHP(IW)
      GOTO 133
  132 SWORK(IA)=(SIM(IA,2)+SIM(IA,3))*N
      GOTO 120
C
C  ***ACCUMULATE SIMULATION WORKLOAD
  133 SWORK(IA)=SWORK(IA)+TEMP1*SIM(IA,2)+SIM(IA,3)
  121 CONTINUE
  120 CONTINUE
C
C
C
C     SUBROUTINE SPEED
C
C
C
C  ***DETERMINATION OF SPEED MATRICS
C
C
C  ***DETERMINE MAXIMUM AVERAGE OPERATING SPEED FOR FREEWAY
      TEMP1=0.9*DSPEED
C
C  ***ESTABLISH THE NUMBER OF SPEED CATEGORIES
      N=LANES+1
C
C  ***DETERMINE SPEED LIMIT ON DETOUR
      SLIMIT(LANES)=DETOUR(3)
```

```
C
C   ***DO FOR EACH SPEED CATEGORY
       DO 550 IC=1,N
C
C
C   ***HOW MANY LANES OPEN TO THE MOTOREST
       M=LANES-IC
C
C   ***MINUS IS FREEWAY, ZERO IS DETOUR
       IF(M)560,561,562
C
C   ***LANE CAPACITY COMPUTATIONS
C
  560 CPLANE=CAP(IC)/LANES
       GOTO 563
  561 CPLANE=DETOUR(5)/DETOUR(7)
       GOTO 563
  562 CPLANE=CAP(IC)/M
  563 CONTINUE
C
C   ***COMPUTE SPEED AT CAPACITY
       TEMP2=12.0*CPLANE +.5*CPLANE**4.46
C
C   ***DETERMINE MAXIMUM SPEED LOSS
       TEMP3=TEMP1-TEMP2
C
C   ***DO FOR ELEVEN INCREMENTS OF THE VOLUME-CAPACITY RATIO
       DO 551 I=1,11
C
C   ***DETERMINE A VOLUME
       FACT2=(I-1)*CPLANE/10.
       VC=FACT2/CPLANE
C
C   ***ESTABLISH CONSTANT SPEED LOSS
       TEMP4=(.4*FACT2-10)*VC
C
C   ***DETERMINE TOTAL AVAILABLE SPEED LOSS TO CAPACITY SPEED
       TEMP5=TEMP3-TEMP4
       IF(TEMP5.LT.0)TEMP5=0
C
C   ***DETERMINE SPEED LOSS TO CAPACITY SPEED
       TEMP6=VC**25*TEMP5
C
C   ***COMPUTE AND HOLD SPEED
       SP(IC,I)=TEMP1-TEMP4-TEMP6
C
C   ***DETERMINE SPEED FOR SPEED LIMIT
       TEMP7=SLIMIT(IC)*.9-3.6*VC
C
C   ***TEST FOR MINIMUM SPEED AND HOLD MIMIMUM
       IF(SP(IC,I).GT.TEMP7)SP(IC,I)=TEMP7
  551 CONTINUE
  550 CONTINUE
C
```

```
C
C      SUBROUTINE INOCC
C
C
C***   CREATION OF THE IHOUR ARRAY FOR OCCUPANCY TIME
C***   CREATE A OCCUPANCY ARRAY FOR EACH ACTIVITY
       DO 1342 IA=1,7
C
C***   ZERO INDEX SO DEFAULT OCCURS IF ACTIVITY IS NOT IDENTIFIED
       INDEX=0
C
C  ***IF THE CREWHOUR VARIABLE 'OVER(1,IA)' IS EQUAL TO 24
C  ***THEN ASSIGN 1'S TO THE IHOUR ARRAY FOR ACTIVIY IA
       IF(OVER(1,IA).EQ.24)INDEX=1
       DO 1341 IH=1,24
       IHOUR(IH,IA)=INDEX
 1341  CONTINUE
       IF(INDEX.EQ.1)GOTO 1342
C
C***   SEARCH FOR A MATCH TO ACTIVITY NUMBER
       DO 1343 I=1,10
       IF(INOCC(I,1).NE.IA)GOTO 1343
C
C***   ESTABLISH A "FROM", "TO" OCCUPANCY RANGE
       IN1=INOCC(I,2)
       IN2=INOCC(I,3)
C
C***   THE "FROM" OCCUPANCY HOUR CANNOT EXCEED THE "TO" OCCUPANCY HOUR
       IF(IN1.GT.IN2)IN2=IN2+24
C
C***   SET INDEX TO EQUAL 1 SO THE DEFAULT ROUTINE IS BYPASSED
       INDEX=1
C
C***   ASSIGN 1 TO IHOUR FOR EACH HOUR WHEN ROAD CAN BE OCCUPIED
       DO 1345 J=IN1,IN2
       J1=J
C
C***   THE IHOUR ARRAY CAN NOT EXCEED 24
       IF(J1.GT.24)J1=J1-24
 1345  IHOUR(J1,IA)=1
 1343  CONTINUE
 1344  IF(INDEX.EQ.1)GOTO 1349
C
C***   DEFAULT OPTION FOR WHEN NO ACTIVITY HAS BEEN IDENTIFIED
C***   SEARCH FOR A MATCH TO ACTIVITY NUMBER TEN
       DO 1346 I=1,10
       IF(INOCC(I,1).NE.10)GOTO 1346
C
C***   ESTABLISH A "FROM", "TO" OCCUPANCY RANGE
       IN1=INOCC(I,2)
       IN2=INOCC(I,3)
C
C***   THE "FROM" OCCUPANCY HOUR CANNOT EXCEED THE "TO" OCCUPANCY HOUR
       IF(IN1.GT.IN2)IN2=IN2+24
```

```
      DO 1347 J=IN1,IN2
      J1=J
C
C***  THE IHOUR ARRAY CANNOT EXCEED 24
      IF(J1.GT.24)J1=J1-24
C
C***  ASSIGN 1 TO IHOUR FOR EACH HOUR WHEN ROAD CAN BE OCCUPIED
 1347 IHOUR(J1,IA)=1
 1346 CONTINUE
 1349 CONTINUE
 1342 CONTINUE
C
C
C     SUBROUTINE RECON
C
C
 1300 CONTINUE
C
C***  BALANCE DISTRIBUTION OF TRIP PURPOSES TO REFLECT INPUT % COM.VEH.
C
C***  FOR INITIAL AND FINAL YEAR
      DO 1301 I=1,2
C
C***  FOR AM AND PM PEAK DIRECTIONS
      DO 1302 ID=1,2
C
C***  INITIALIZE VARIABLE TO HOLD SUM OF PERCENTAGES
      TEMP1=0
C
C***  SUM PERCENTAGES OF PASSENGER CAR TRIP PURPOSES
      DO 1303 IT=1,5
      TEMP1=TEMP1+PERCNT(IT,ID,I)
 1303 CONTINUE
C
C***  ESTABLISH CORRECTION FACTOR FOR PASSENGER CAR TRIP PURPOSES
      FACT1=(1-.01*TRUCKS(I))/TEMP1
C
C***  CORRECT PASSENGER CAR TRIP PURPOSE PERCENTAGES
      DO 1304 IT=1,5
      PERCNT(IT,ID,I)=PERCNT(IT,ID,I)*FACT1
 1304 CONTINUE
C
C***  REPLACE ASSUMED PERCENTAGE OF COMMERCIAL VEHICLES WITH INPUT PERCENTAGE
      PERCNT(6,ID,I)=.01*TRUCKS(I)
 1302 CONTINUE
 1301 CONTINUE
C
C
C**   RECONCILE OVERRIDDEN 100% DISTRIBUTIONS FOR EACH TRIP PURPOSE
C
      DO 1305 I=1,2
      DO 1306 ID=1,2
      DO 1307 IT=1,6
C
```

```
C***  TEST TO SEE IF DISTRIBUTION WAS OVERRIDDEN
      IF(IBAL(IT,ID,I).EQ.0)GOTO 1307
      TEMP1=0
C
C***  SUM PERCENTAGES OF OVERRIDDEN DISTRIBUTION
      DO 1308 IH=1,24
      TEMP1=TEMP1+PCTADT(IH,IT,ID,I)
 1308 CONTINUE
C
C***  ROUND SUM OF PERCENTAGES TO NEAREST .1%
      ITEST=(TEMP1+.0005)*1000
C
C***  IF SUM OF PERCENTAGES NOT EQUAL TO 100% RECONCILE EACH PERCENTAGE
      IF(ITEST.EQ.1000)GOTO 1307
      FACT1=1/TEMP1
      DO 1309 IH=1,24
      PCTADT(IH,IT,ID,I)=PCTADT(IH,IT,ID,I)*FACT1
 1309 CONTINUE
 1307 CONTINUE
C
C
C**   TEST FOR BALANCE OR CREATE DISTRIBUTION OF ALL TRIPS
C
      IF(IBAL(7,ID,I).EQ.0)GOTO 1315
C
C
C**   BALANCE ALL TRIPS DISTRIBUTION
C
      TEMP1=0
C
C***  SUM PERCENTAGES
      DO 1310 IH=1,24
      TEMP1=TEMP1+PCTADT(IH,7,ID,I)
 1310 CONTINUE
C
C***  ROUND SUM OF PERCENTAGES TO NEAREST .1%
      ITEST=(TEMP1+.0005)*1000
C
C***  IF SUM OF PERCENTAGES NOT EQUAL TO 100 RECONCILE EACH PERCENTAGE
      IF(ITEST.EQ.1000)GOTO 1311
      FACT1=1/TEMP1
      DO 1311 IH=1,24
      PCTADT(IH,7,ID,I)=PCTADT(IH,7,ID,I)*FACT1
 1311 CONTINUE
      DO 1312 IH=1,24
      TEMP1=0
      DO 1313 IT=1,6
C
C***  ADJUST 100% DISTRIBUTIONS BY DISTRIBUTION OF TRIP PURPOSES
      PCTADT(IH,IT,ID,I)=PCTADT(IH,IT,ID,I)*PERCNT(IT,ID,I)
C
C***  SUM PERCENTAGES OF INDIVIDUAL TRIP PURPOSES
      TEMP1=TEMP1+PCTADT(IH,IT,ID,I)
 1313 CONTINUE
```

```
      FACT1=PCTADT(IH,7,ID,I)/TEMP1
C
C***  BALANCE INDIVIDUAL TRIP PURPOSES DISTRIBUTION TO DISTRIBUTION OF ALL TRIPS
      DO 1314 IT=1,6
      PCTADT(IH,IT,ID,I)=PCTADT(IH,IT,ID,I)*FACT1
 1314 CONTINUE
 1312 CONTINUE
      GOTO 1306
C
C
C**   CREATE DISTRIBUTION OF ALL TRIPS
C
 1315 CONTINUE
      DO 1316 IH=1,24
      TEMP1=0
      DO 1317 IT=1,6
C
C***  ADJUST 100%DISTRIBUTIONS BY DISTRIBUTION OF TRIP PURPOSES
      PCTADT(IH,IT,ID,I)=PCTADT(IH,IT,ID,I)*PERCNT(IT,ID,I)
C
C***  SUM PERCENTAGES OF INDIVIDUAL TRIP PURPOSES
      TEMP1=TEMP1+PCTADT(IH,IT,ID,I)
 1317 CONTINUE
C
C***  PERCENTAGE OF ALL TRIPS EQUALS SUM OF INDIVIDUAL TRIP PUTPOSES
      PCTADT(IH,7,ID,I)=TEMP1
 1316 CONTINUE
 1306 CONTINUE
 1305 CONTINUE
C
C
C**   TEST FOR AVERAGE MORNING AND EVENING PEAKS
C
      IF(IDIR.NE.3)GOTO 1331
      DO 1318 I=1,2
      DO 1319 IT=1,7
      DO 1320 IH=1,24
C
C***  AVERAGE MORNING AND EVENING PEAKS
      PCTADT(IH,IT,1,I)=(PCTADT(IH,IT,1,I)+PCTADT(IH,IT,2,I))/2
      PCTADT(IH,IT,2,I)=PCTADT(IH,IT,1,I)
 1320 CONTINUE
 1319 CONTINUE
 1318 CONTINUE
 1331 CONTINUE
C
C
C**   CONVERT DAILY DISTRIBUTION OF TRIP PURPOSES TO HOURLY DISTRIBUTIONS
C
C
C***  INITIAL AND FINAL YEAR
      DO 1321 I=1,2
C
C***  A.M. AND P.M. PEAK DIRECTIONS
```

```
      DO 1322 ID=1,2
C
C***  EACH HOUR OF THE DAY
      DO 1323 IH=1,24
C
C***  ESTABLISH DAILY TO HOURLY CONVERSION FACTOR
      FACT1=1/PCTADT(IH,7,ID,I)
C
C***  EACH TRIP PURPOSE
      DO 1324 IT=1,6
      PCTADT(IH,IT,ID,I)=PCTADT(IH,IT,ID,I)*FACT1
 1324 CONTINUE
 1323 CONTINUE
 1322 CONTINUE
 1321 CONTINUE
C
C
C**   CREATE BASE YEAR AND YEARLY INCREMENT ARRAYS
C
      MYEARS=NYEARS-1
      DO 1328 ID=1,2
      DO 1329 IT=1,7
      DO 1330 IH=1,24
C
C***  COMPUTE YEARLY INCREMENT
      PCTADT(IH,IT,ID,2)=(PCTADT(IH,IT,ID,2)-PCTADT(IH,IT,ID,1))/MYEARS
C
C***  COMPUTE BASE YEAR DISTRIBUTIONS
      PCTADT(IH,IT,ID,1)=PCTADT(IH,IT,ID,1)-PCTADT(IH,IT,ID,2)
 1330 CONTINUE
 1329 CONTINUE
 1328 CONTINUE
C
C***  CONVERT INITIAL AND FINAL VOLUME TO BASE YEAR AND YEARLY INCREMENT
      VOLUME(2)=(VOLUME(2)-VOLUME(1))/MYEARS
      VOLUME(1)=VOLUME(1)-VOLUME(2)
C
C***  CONVERT INITIAL AND FINAL % COMMERCIAL TO BASE YEAR & YEARLY INCREMENT
      TRUCKS(2)=(TRUCKS(2)-TRUCKS(1))/MYEARS
      TRUCKS(1)=TRUCKS(1)-TRUCKS(2)
C
C***  CONVERT INITIAL AND FINAL AM. PM. SPLIT TO BASE YEAR & YEARLY INCREMENT
      SPLIT(2)=(SPLIT(2)-SPLIT(1))/MYEARS
      SPLIT(1)=SPLIT(1)-SPLIT(2)
      RETURN
      END
```

```
C
C
C*********************************************************************C
C*********************************************************************C
C*****************                                    ***************C
C*****************          SUBROUTINE OPPARA         ***************C
C*****************                                    ***************C
C*****************          PROGRAM 'EAROMAR'         ***************C
C*****************                                    ***************C
C*********************************************************************C
C*********************************************************************C
C*********************************************************************C
C
      SUBROUTINE OPPARA
      INTEGER COSTS(7,5,8,2)
      COMMON           ARHO,             CAP(5),          COSTS,
     1 CWT,            DVOL(24),         HVOL(24),        ID,
     2 IHOUR(24,7),    ITYPE,            IY,              KP,
     3 LANES,          MI,               MO,              NYEARS,
     4 OCOSTS(65,2),   PATCHF(1000),     PATCHP(1000),    PROJLN,
     5 RLOC(1000),     SIM(7,5),         SP(5,11),        SPEEDD(24),
     6 SPEEDN(24),     SPLIT(2),         SWORK(7),        TRUCKS(2),
     7 VOLUME(2),      VTRATE(5,40),     ZONEL(7,4)
      COMMON/ASSUME/   ALIGN(3,6),       AACOST,          COMVOT,
     1 DETOUR(7),      DLIFE,            FUEL(2),         HRS(7,24,4),
     2 HWORK(7),       IDIR,             INC,             IPRINT,
     3 IWT,            JPRINT,           OCSCHL,          OCWORK,
     4 OIL(2),         OVER(12,7),       PCTADT(24,7,2,2),PS(7,3,3),
     5 PSIRS,          RATEI,            RLIFE,           SINDEX,
     6 SLIMIT(5),      TCMOVE,           TIRES(2),        TLEVEL(7),
     7 WALK,           WIDTH,            WEIGHT(10,3)
      DIMENSION OCOST(65,4,2)
C
C
C     SUBROUTINE VTIME
C
C
      DIMENSION AC(5),BO(5),BT(5),BIT(5)
      DIMENSION ACP(5),BTP(5),BITP(5)
C
C  ***INITIALIZE SCALE FACTORS,INTERCEPTS,AND COEFFICIENTS OF BENEFITS EQUATIONS
      DATA AC/0.0757,0.0594,0.0627,0.0231,.0813/
      DATA ACP/0.0337,0.0281,0.0360,0.0165,0.0686/
      DATA BO/-59.34,-112.3,-168.2,-11.91,-110.8/
      DATA BIT/1.030,2.497,3.488,1.440,1.779/
      DATA BITP/0.862,1.628,4.130,1.440,1.779/
      DATA BT/3.829,4*0.0/
      DATA BTP/-0.041,4*0.0/
C
C***  I IS THE MAXIMUM ACCURATE VALUE OF TIME FOR WORK TRIPS
      I=40
C
C***  THE VALUE OF TIME PER VEHICLE CONVERSION FACTOR FOR WORK TRIPS IS
C***  THE PASSENGERS PER VEHICLE
```

```
      FACT1=OCWORK
C
C
C
C*    DO LOOP FOR EACH PASSENGER CAR TRIP PURPOSE
C
      DO 1510 IT=1,5
C
C
C**   COMPUTE HOURLY VALUE OF TIME SAVINGS BETWEEN 5 AND 14 MINUTES
C
      DO 1520 J=5,14
C
C***  FACT2 IS THE VALUE OF THE BENEFITS FUNCTION FOR A TIME SAVINGS J
      FACT2=BO(IT)+J*(BT(IT)+BIT(IT)*INC)
C
C***  FACT3 IS THE PERCENTILE OF MOTORISTS HAVING ZERO BENEFITS
      FACT3=1.0/(1.0+EXP(AC(IT)*FACT2))
C
C***  FACT4 IS THE PERCENTILE OF MOTORISTS HAVING THE AVERAGE BENEFIT
      FACT4=(1.0+FACT3)/2
C
C***  FACT5 IS THE AVERAGE BENEFIT OF ALL MOTORISTS HAVING A TIME SAVIGS J
      FACT5=(1.0-FACT3)*(FACT2+ALOG(FACT4/(1.0-FACT4))/AC(IT))
C
C***  VTRATE IS THE VALUE OF TIME PER VEHICLE IN DOLLARS PER HOUR
      VTRATE(IT,J)=FACT5/100/J*60*FACT1
 1520 CONTINUE
C
C
C**   COMPUTE THE HOURLY VALUE OF TIME SAVINGS BETWEEN 14 AND I MINUTES
C
C***  BO2 IS THE INTERCEPT  OF THE BENEFITS FUNCTION FOR A TIME SAVING OF
C***  GREATER THE 14 MINUTES
      BO2=BO(IT)+14.0*(BT(IT)-BTP(IT)+(BIT(IT)-BITP(IT))*INC)
C
C***  FACT6 IS THE VALUE OF THE BENEFITS FUNCTION FOR A TIME SAVINGS
C***  BETWEEN 5 AND 14 MINUTES AT 14.5 MINUTES
      FACT6=BO(IT)+14.5*(BT(IT)+BIT(IT)*INC)
C
C***  FACT7 IS THE PERCENTILE OF MOTORISTS HAVING ZERO BENEFITS FOR A TIME
C***  SAVINGS OF 14.5 MINUTES USING THE BENEFITS FUNCTION FOR A TIME
C***  SAVINGS BETWEEN 5 AND 14 MINUTES
      FACT7=1.0/(1.0+EXP(AC(IT)*FACT6))
C
C***  TEMP1 IS THE AVERAGE BENEFIT OF ALL MOTORISTS HAVING A TIME SAVINGS
C***  OF 14.5 MINUTES USING THE BENEFITS FUNCTION FOR A TIME SAVINGS BETWEEN
C***  5 AND 14 MINUTES
      TEMP1=(1.0-FACT7)*(FACT6+ALOG((1+FACT7)/(1-FACT7))/AC(IT))
C
C***  FACT8 IS THE VALUE OF THE BENEFITS FUNCTION FOR A TIME SAVINGS OF
C***  GREATER THEN 14 MINUTES AT 14.5 MINUTES
      FACT8=BO2+14.5*(BTP(IT)+BITP(IT)*INC)
C
```

```
C***  FACT9 IS THE PERCENTILE OF MOTORISTS HAVING ZERO BENEFITS FOR A TIME
C***  SAVINGS OF 14.5 MINUTES USING THE BENEFITS FUNCTION FOR A TIME SAVINGS
C***  OF GREATER THAN 14 MINUTES
      FACT9=1.0/(1.0+EXP(ACP(IT)*FACT8))
C
C***  TEMP2 IS THE AVERAGE BENEFIT OF ALL MOTORISTS HAVING A TIME SAVINGS OF
C***  14.5 MINUTES USING THE BENEFITS FUNCTION FOR TIME SAVINGS GREATER THAN 14
C***  MINUTES
      TEMP2=(1.0-FACT9)*(FACT8+ALOG((1+FACT9)/(1-FACT9))/ACP(IT))
C
C***  COMPUTE THE ADJUSTMENT TO BE ADDED TO THE BENEFITS FUNCTION FOR
C***  TIME SAVINGS OF GREATER THAN 14 MINUTES
C***  TEMP3 IS THE ADJUSTMENT NECESSARY TO THE VALUES OF TIME SAVINGS
C***  OF GREATER THAN 14 MINUTES TO MAKE THE VALUE OF TIME A CONTINUOUS FUNCTION
      TEMP3=TEMP1-TEMP2
C
C
C**   COMPUTE THE HOURLY VALUE OF TIME  FOR TIME SAVINGS BETWEEN 15 AND
C**   I MINUTES
C
      DO 1530 J=15,I
C
C***  FACT2 IS THE VALUE OF THE BENEFITS FUNCTION FOR A TIME SAVINGS J
      FACT2=B02+J*(BTP(IT)+BITP(IT)*INC)
C
C***  FACT3 IS THE PERCENTILE OF MOTORISTS HAVING ZERO BENEFITS
      FACT3=1.0/(1.0+EXP(ACP(IT)*FACT2))
C
C***  FACT4 IS THE PERCENTILE OF MOTORISTS HAVING THE AVERAGE BENEFIT
      FACT4=(1.0+FACT3)/2
C
C***  FACT5 IS THE AVERAGE BENEFIT OF ALL MOTORISTS HAVING A TIME SAVINGS J
      FACT5=(1.0-FACT3)*(FACT2+ALOG(FACT4/(1.0-FACT4))/ACP(IT))+TEMP3
C
C***  VTRATE IS THE VALUE OF TIME PER VEHICLE IN DOLLARS PER HOUR
      VTRATE(IT,J)=FACT5/100/J*60*FACT1
 1530 CONTINUE
C
C***  THE VALUE OF TIME PER VEHICLE CONVERSION FACTOR FOR SOCIAL-RECREATIONAL,
C***  PERSONAL BUSSINESS, AND VACATION TRIPS IS 1
      FACT1=1
C
C***  THE VALUE OF TIME PER VEHICLE CONVERSION FACTOR FOR SCHOOL TRIPS IS
C***  THE PASSENGERS PER VEHICLE
      IF(IT.EQ.4)FACT1=OCSCHL
C
C
C**   THE HOURLY RATE FOR ALL TIME SAVINGS GREATER THAN I IS THE SAME AS
C**   THE RATE FOR A TIME SAVINGS OF I MINUTES
C
      DO 1540 J=I,40
      VTRATE(IT,J)=VTRATE(IT,I)
 1540 CONTINUE
C
```

```
C
C**   THE HOURLY RATE FOR A TIME SAVINGS OF LESS THAN 5 MINUTES IS THE RATE
C**   OF TIME SAVINGS FOR A 5 MINUTE TIME SAVINGS
C
      DO 1550 J=1,5
      VTRATE(IT,J)=VTRATE(IT,5)
 1550 CONTINUE
      GOTO(1560,1570,1570,1560,1510),IT
C
C***  INITIALIZE SUBSCRIPT FOR MAXIMUM ACCURATE VALUE OF TIME RATE FOR
C***  SOCIAL-RECREATIONAL AND SCHOOL TRIPS
 1560 I=20
      GOTO 1510
C
C***  INITIALIZE SUBSCRIPT FOR MAXIMUM ACCURATE VALUE OF TIME RATE FOR
C***  PERSONEL BUSSINESS AND VACATION TRIPS
 1570 I=30
 1510 CONTINUE
C
C
C     SUBROUTINE OPCOST
C
C
      DO 1981 I=1,65
      OCOSTS(I,1)=0
      OCOSTS(I,2)=0
 1981 CONTINUE
C
C  ***DETERMINE OPERATION PARAMETER FOR 65 SPEEDS
      DO 1400 IS=1,65
      SS=IS
C
C  ***FUEL CONSUMPTION IN GALLONS PER PASSENGER CAR VEHICLE PER HOUR
C
C  ***INITIALIZE TEMPORARY VARIABLES
      TEMP1=0
      TEMP2=0
C
C  ***FUEL CONSUMPTION MODEL FOR LEVEL TANGENT SECTIONS
      TEMP3=EXP(-.4844+.0285*IS)
C
C  ***FUEL CONSUMPTION MODELS FOR POSITIVE GRADES
      DO 1405 I=1,6
      IF(ALIGN(1,I).EQ.0)GOTO 1405
      A=-.45+.0278*IS
      B=.0348+.0214*ALOG(SS)
C
C  ***ACCUMULATE PRORATED FUEL CONSUMPTION FOR POSITIVE GRADES
      TEMP1=TEMP1+EXP(A+B*I)*ALIGN(1,I)/PROJLN
C
C  ***ACCUMULATE MILEAGE ASSOCIATED WITH POSITIVE GRADES
      TEMP2=TEMP2+ALIGN(1,I)
 1405 CONTINUE
C
```

```
C   ***FUEL CONSUMPTION MODELS FOR NEGATIVE GRADES
       DO 1406 I=1,6
       IF(ALIGN(2,I).EQ.0)GOTO 1406
C
C   ***COMPUTE FLOAT SPEED
       TEMP5=3+7*I
C
C   ***INITIALIZE TEMP4,THE INCREMENT OF FUEL CONSUMPTION ABOVE FLOAT SPEED
       TEMP4=0
C
C   ***TEST TO DETERMINE IF THE FLOAT SPEED IS EXCEEDED
       IF(IS.LT.TEMP5)GOTO 1416
C
C   ***COMPUTE THE INCREMENT OF FUEL CONSUMPTION ABOVE FLOAT SPEED
       TEMP4=TEMP3-EXP(-.4844+.0285*TEMP5)
C
C   ***COMPUTE THE FUEL CONSUMPTION ASSOCIATED WITH SPEEDS BELOW FLOAT SPEED
 1416  TEMP6=1/(1.61+.1*IS)
C
C   ***ACCUMULATE PRORATED FUEL CONSUMPTION FOR POSITIVE AND NEGATIVE GRADES
       TEMP1=TEMP1+(TEMP6+TEMP4)*ALIGN(2,I)/PROJLN
C
C   ***ACCUMULATE MILEAGE ASSOCIATED WITH POSITIVE AND NEGATIVE GRADES
       TEMP2=TEMP2+ALIGN(2,I)
 1406  CONTINUE
C
C   ***FUEL CONSUMPTION MODELS FOR HORIZONTAL ALIGNMENT
       DO 1407 I=1,6
       IF(ALIGN(3,I).EQ.0)GOTO 1407
       C=I
       A=-.483-.087*ALOG(C)
       B=EXP(-3.562+.044*I)
C
C   ***COMPUTE EXCESS FUEL CONSUMPTION ASSOCIATED WITH HORIZONTAL ALIGNMENT
       TEMP4=EXP(A+B*IS)-TEMP3
C
C   ***TEST TO BE SURE ANY EXCESS IS POSITIVE
       IF(TEMP4.LT.0)GOTO 1407
C
C   ***ADD EXCESS FUEL CONSUMPTION ASSOCIATED WITH HORIZONTAL ALIGNMENT
       TEMP1=TEMP1+TEMP4*(ALIGN(3,I)/PROJLN)
 1407  CONTINUE
C
C   ***HOLD FUEL CONSUMPTION FOR 4000 LB. PASSENGER VEHICLE PER HOUR BY SPEED
 1408  OCOST(IS,1,1)=TEMP1+TEMP3*(PROJLN-TEMP2)/PROJLN
C
C   ***TIRE WEAR IN .001 INCHES OF WEAR PER VEHICLE PER HOUR
C   ***INITIAL TEMPORARY VARIABLES
       TEMP1=0
       TEMP2=0
C
C   ***TIRE WEAR MODEL FOR LEVEL TANGENT SECTIONS
       TEMP3=EXP(-8.265+2.226*ALOG(SS))
C
```

```
C   ***TIRE WEAR MODELS FOR POSITIVE GRADES
       DO 1410 I=1,6
.      IF(ALIGN(1,I).EQ.0)GOTO 1410
       A=-8.26+.095*I
       B=2.23-.015*I
C
C   ***ACCUMULATE PRORATED TIRE WEAR FOR POSITIVE GRADES
       TEMP1=TEMP1+(EXP(A+B*ALOG(SS))*ALIGN(1,I)/PROJLN)
C
C   ***ACCUMULATE MILEAGE ASSOCIATED WITH POSITIVE GRADES
       TEMP2=TEMP2+ALIGN(1,I)
 1410 CONTINUE
C
C   ***TIRE WEAR MODELS FOR NEGATIVE GRADES
       DO 1411 I=1,6
       IF(ALIGN(2,I).EQ.0)GOTO 1411
       A=-8.26+.2*I
       B=2.23-.07*I
C
C   ***ACCUMULATE PRORATED TIRE WEAR FOR POSITIVE AND NEGATIVE GRADES
       TEMP1=TEMP1+(EXP(A+B*ALOG(SS))*ALIGN(2,I)/PROJLN)
C
C   ***ACCUMULATE MILEAGE ASSOCIATED WITH POSITIVE AND NEGATIVE GRADES
       TEMP2=TEMP2+ALIGN(2,I)
 1411 CONTINUE
C
C   ***TIRE WEAR MODELS FOR HORIZONTAL ALIGNMENT
       DO 1412 I=1,6
       C=I
       IF(ALIGN(3,I).EQ.0)GOTO 1412
       A=-3.1+.59*ALOG(C)
       B=.077+.0023*I
C
C   ***ADD EXCESS TIRE WEAR ASSOCIATED WITH HORIZONTAL ALIGNMENT
       TEMP1=TEMP1+(EXP(A+B*IS)-TEMP3)*(ALIGN(3,I)/PROJLN)
 1412 CONTINUE
C
C   ***HOLD TIRE WEAR FOR 4000 LB. PASSENGER VEHICLE PER HOUR BY SPEED
 1413 OCOST(IS,2,1)=TEMP1+TEMP3*(PROJLN-TEMP2)/PROJLN
C
C   ***OIL CONSUMPTION IN QUARTS PER PASSENGER CAR VEHICLE PER HOUR
C
C   ***OIL CONSUMPTION MODELS FOR VERTICAL ALIGNMENT
C   ***INITIAL TEMPORARY VARIABLES
       TEMP1=0
       TEMP2=0
C
C   ***OIL CONSUMPTION FOR LEVEL TANGENT SECTIONS
       TEMP3=EXP(-3.414+.0242*IS)
       DO 1420 I=1,6
       TEMP4=ALIGN(1,I)+ALIGN(2,I)
       IF(TEMP4.EQ.0)GOTO 1420
       A=-3.414-.0184*I
       B=.0242+.00142*I
```

```
C
C   ***ACCUMULATE PRORATED OIL CONSUMPTION FOR VERTICAL ALIGNMENT
      TEMP1=TEMP1+(EXP(A+B*IS))*TEMP4/PROJLN
C
C   ***ACCUMULATE MILEAGE ASSOCIATED WITH VERTICAL ALIGNMENT
      TEMP2=TEMP2+TEMP4
 1420 CONTINUE
C
C   ***HOLD OIL CONSUMPTION FOR 4000 LB. PASSENGER VEHICLE PER HOUR BY SPEED
 1421 OCOST(IS,3,1)=TEMP1+TEMP3*(PROJLN-TEMP2)/PROJLN
C
C   ***PASSENGER VEHICLE MAINTENANCE COST IN DOLLARS PER HOUR FOR SPEED IS
C
C   ***MAINTENANCE COST MODEL FOR LEVEL TANGENT SECTIONS
      TEMP3=EXP(-5.828+1.278*ALOG(SS))
C
C   ***INITIAL TEMPORARY VARIABLES
      TEMP1=0
      TEMP2=0
C
C   ***MAINTENANCE COSTS MODELS FOR POSITIVE GRADES
      DO 1430 I=1,6
      IF(ALIGN(1,I).EQ.0)GOTO 1430
      A=5.828-.014*I
      B=1.278+.001*I
C
C   ***ACCUMULATE PRORATED MAINTENANCE COSTS FOR POSITIVE GRADES
      TEMP1=TEMP1+EXP(-A+B*ALOG(SS))*ALIGN(1,I)/PROJLN
C
C   ***ACCUMULATE MILEAGE ASSOCIATED WITH POSITIVE GRADES
      TEMP2=TEMP2+ALIGN(1,I)
 1430 CONTINUE
C
C   ***MAINTENANCE COSTS MODELS FOR NEGATIVE GRADES
      DO 1431 I=1,6
      IF(ALIGN(2,I).EQ.0)GOTO 1431
      A=5.828-.0285*I
      B=1.278-.011*I
C
C   ***ACCUMULATE PRORATED MAINTENANCE COSTS FOR POSITIVE AND NEGATIVE GRADES
      TEMP1=TEMP1+EXP(-A+B*ALOG(SS))*ALIGN(2,I)/PROJLN
C
C   ***ACCUMULATE MILEAGE ASSOCIATED WITH POSITIVE AND NEGATIVE GRADES
      TEMP2=TEMP2+ALIGN(2,I)
 1431 CONTINUE
C
C   ***HOLD MAINTENANCE COST FOR 4000 LB. PASSENGER VEHICLE PER HOUR BY SPEED
 1432 OCOST(IS,4,1)=TEMP1+TEMP3*(PROJLN-TEMP2)/PROJLN
C
C   ***DEPRECIATION RATE FOR PASSENGER CARS PER HOUR AT SPEED IS
C
C   ***ANNUAL PASSENGER MILEAGE IS A FUNCTION OF SPEED IS
      TEMP1=1974*IS**.489
C
```

```
C   ***YEARS TO SCRAP IS A FUNCTION OF ANNUAL MILEAGE
      TEMP2=47.5-3.88*ALOG(TEMP1)
C
C   ***THE HOURLY DEPRECIATION RATE OF PASSENGER CARS IS (1/LIFEMILEAGE/SPEED IS)
      OCOST(IS,4,2)=1/((TEMP1*TEMP2)/IS)
 1400 CONTINUE
C
C
C
C   ***CONVERSION OF PASSENGER CAR OPERATION PARAMETERS TO COMPOSITE COMMERCIAL
C
C
C   ***CONVERT FOR 65 SPEEDS
C
      DO 1450 IS=1,65
C
C   ***ADDRESS THE PARAMETERS FUEL,TIRES,OIL AND MAINTENANCE
C
      DO 1451 I1=1,4
C
C   ***INITIATE THE VEHICLE WEIGHT COUNTER
      I=1
C
C   ***BRANCH TO APPROPRIATE OPERATION PARAMETER
      GOTO(1453,1454,1455,1456),I1
C
C   ***FUEL CONSUMPTION WEIGHT RATIO FACTOR COMPUTATION
 1453 A=1/(.46+.0344*IS-.00031*IS**2)
      B=1/(.78+.0437*IS-.00047*IS**2)
      RW=EXP(-A+B*(ALOG(WEIGHT(I,1))))
      GOTO(1457),I
      GOTO 1459
C
C   ***TIRE WEAR WEIGHT RATIO FACTOR COMPUTATION
 1454 RW=.76+.061*WEIGHT(I,1)
      GOTO(1457),I
      GOTO 1459
C
C   ***OIL CONSUMPTION WEIGHT RATIO FACTOR COMPUTATION
 1455 A=.930+.003*IS
      B=-.0149+.00004*IS
      RW=1/(A+B*WEIGHT(I,1))
      IF(WEIGHT(I,1).LE.50)GOTO 1452
      RW=3*WEIGHT(I,1)/(30+IS)
 1452 CONTINUE
      GOTO(1457),I
      GOTO 1459
C
C   ***MAINTENANCE COSTS WEIGHT RATIO FACTOR COMPUTATION
 1456 FACT1=IABS(IS-20)
      A=.12+.0084*FACT1
      B=.315+.0021*FACT1
      C=.00438+.000023*FACT1
      RW=-A+B*WEIGHT(I,1)-C*WEIGHT(I,1)**2
```

```
      IF(WEIGHT(I,1).LE.50.0)GOTO 1466
      RW=4.68+.039*FACT1+.0772*(WEIGHT(I,1)-50)
 1466 CONTINUE
C
C  ***DEPRECIATION WEIGHT RATIO FACTOR COMPUTATION
      TEMP3=EXP(.163-.031*WEIGHT(I,1))
      GOTO(1457),I
      GOTO 1461
C
C  ***HOLD PASSENGER CAR WEIGHT RATIO IN FACT2
 1457 FACT2=RW
      IF(I1.NE.4)GOTO 1458
C
C  ***MAINTENANCE COSTS FOR PASSENGER CAR FACTORED BY SERVICES INDEX
      OCOST(IS,I1,1)=OCOST(IS,I1,1)*SINDEX
C
C  ***DEPRECIATION RATE FOR PASSENGER CAR CONVERTED TO DOLLARS
      OCOST(IS,I1,2)=OCOST(IS,I1,2)*WEIGHT(1,3)
C
C  ***INITALIZE TEMPORARY VARIABLES FOR THE DEVELOPMENT OF COMPOSITE
C  ***COMMERCIAL VEHICLE OPERATION PARAMETER ARRAY
 1458 TEMP1=0
      TEMP2=0
      TEMP4=0
C
C  ***INCREMENT THE COMMERCIAL VEHICLE WEIGHT CLASS
 1480 I=I+1
C
C  ***TEST FOR LAST VEHICLE CLASS
      IF(I.GT.IWT)GOTO 1470
C
C  ***ACCUMULATE THE PERCENTAGE OF COMMERCIAL VEHICLES
      TEMP2=TEMP2+WEIGHT(I,2)
C
C  ***BRANCH TO THE APPROPRIATE OPERATION PARAMETER
      GOTO(1453,1454,1455,1456),I1
C
C  ***ACCUMULATE A COMPOSITE WEIGHT RATIO FACTOR FOR DEPRECIATION
 1461 TEMP4=TEMP4+TEMP3*WEIGHT(I,2)*WEIGHT(I,3)/WEIGHT(1,3)
C
C  ***ACCUMULATE THE APPROPRIATE OPERATION PARAMETER WEIGHT RATIO FACTOR
 1459 TEMP1=TEMP1+RW*WEIGHT(I,2)
      GOTO 1480
 1470 IF(I1.NE.4)GOTO 1460
C
C  ***CONVERT THE MAINTENANCE COSTS FOR A PASSENGER CAR TO A COMPARABLE
C  ***COSTS FOR A COMPOSITE COMMERCIAL VEHICLE AND HOLD IN TEMP1
      TEMP1=OCOST(IS,I1,1)*TEMP1/TEMP2
C
C  ***CONVERT THE DEPRECIATION COSTS FOR A PASSENGER CAR TO A COMPARABLE
C  ***COSTS FOR A COMPOSITE COMMERCIAL VEHICLE AND HOLD IN TEMP2
      TEMP2=OCOST(IS,I1,2)*TEMP4/TEMP2
C
C  ***ADD THE DEPRECIATION COSTS TO MAINTENANCE COSTS ARRAY FOR PASSENGER CARS
```

```
C   ***AND ADJUST FOR ACTUAL PASSENGER CAR WEIGHT
      OCOST(IS,I1,1)=OCOST(IS,I1,1)*FACT2+OCOST(IS,I1,2)
C
C   ***ESTABLISH THE COMPOSITE COMMERCIAL VEHICLE MAINTENANCE AND DEPRECIATION
C   ***COSTS ARRAY
      OCOST(IS,I1,2)=TEMP1+TEMP2
      GOTO 1451
C
C   ***CONVERT THE OPERATIONAL PARAMETER FOR A PASSENGER CAR TO A COMPARABLE
C   ***OPERATIONAL PARAMETER FOR A COMPOSITE COMMERCIAL VEHICLE
 1460 OCOST(IS,I1,2)=OCOST(IS,I1,1)*TEMP1/TEMP2
C
C   ***FOUR KIP PASSENGER CAR ADJUSTED FOR ACTUAL PASSENGER CAR WEIGHT
      OCOST(IS,I1,1)=OCOST(IS,I1,1)*FACT2
 1451 CONTINUE
 1450 CONTINUE
C
C   ***CONVERT THE OPERATIONAL PARAMETERS FROM UNITS PER VEHICLE PER HOUR TO
C   ***COSTS PER 1000 VEHICLES PER HOUR FOR ALL OPERATIONAL PARAMETERS
      DO 1490 IS=1,65
      OCOSTS(IS,1)=OCOSTS(IS,1)+OCOST(IS,1,1)*FUEL(1)*1000
      OCOSTS(IS,1)=OCOSTS(IS,1)+OCOST(IS,2,1)*TIRES(1)*1000
      OCOSTS(IS,1)=OCOSTS(IS,1)+OCOST(IS,3,1)*OIL(1)*1000
      OCOSTS(IS,1)=OCOSTS(IS,1)+OCOST(IS,4,1)*1000
      OCOSTS(IS,2)=OCOSTS(IS,2)+OCOST(IS,1,2)*FUEL(2)*1000
      OCOSTS(IS,2)=OCOSTS(IS,2)+OCOST(IS,2,2)*TIRES(2)*1000
      OCOSTS(IS,2)=OCOSTS(IS,2)+OCOST(IS,3,2)*OIL(2)*1000
      OCOSTS(IS,2)=OCOSTS(IS,2)+OCOST(IS,4,2)*1000
 1490 CONTINUE
      TEMP1=0
      TEMP2=0
      DO 1495 I=2,IWT
      TEMP1=TEMP1+WEIGHT(I,1)*WEIGHT(I,2)
      TEMP2=TEMP2+WEIGHT(I,2)
 1495 CONTINUE
      CWT=TEMP1/TEMP2
      RETURN
      END
```

```
C
C
C*********************************************************************C
C*********************************************************************C
C*****************                                     ***************C
C*****************          SUBROUTINE RPRINT          ***************C
C*****************                                     ***************C
C*****************          PROGRAM 'EAROMAR'          ***************C
C*****************                                     ***************C
C*********************************************************************C
C*********************************************************************C
C*********************************************************************C
C
      SUBROUTINE RPRINT
      INTEGER COSTS(7,5,8,2)
      COMMON             ARHO,            CAP(5),           COSTS,
    1 CWT,               DVOL(24),        HVOL(24),         ID,
    2 IHOUR(24,7),       ITYPE,           IY,               KP,
    3 LANES,             MI,              MO,               NYEARS,
    4 OCOSTS(65,2),      PATCHF(1000),    PATCHP(1000),     PROJLN,
    5 RLOC(1000),        SIM(7,5),        SP(5,11),         SPEEDD(24),
    6 SPEEDN(24),        SPLIT(2),        SWORK(7),         TRUCKS(2),
    7 VOLUME(2),         VTRATE(5,40),    ZONEL(7,4)
      COMMON/ASSUME/     ALIGN(3,6),      AACOST,           COMVOT,
    1 DETOUR(7),         DLIFE,           FUEL(2),          HRS(7,24,4),
    2 HWORK(7),          IDIR,            INC,              IPRINT,
    3 IWT,               JPRINT,          OCSCHL,           OCWORK,
    4 OIL(2),            OVER(12,7),      PCTADT(24,7,2,2),PS(7,3,3),
    5 PSIRS,             RATEI,           RLIFE,            SINDEX,
    6 SLIMIT(5),         TCMOVE,          TIRES(2),         TLEVEL(7),
    7 WALK,              WIDTH,           WEIGHT(10,3)
      DIMENSION PAVE(3,3)
      DIMENSION ROAD(2,3)
      DATA PAVE/'    ','  BI','   C','CONC','TUMI','OMPO','RETE',
    X'NOUS','SITE'/
      DATA ROAD/'  4 ','LANE','  6 ','LANE','  8 ','LANE'/
   10 FORMAT(1H1,'TRAFFIC WARRANTS FOR PREMIUM PAVEMENTS ',
     X'REQUIRING REDUCED MAINTENANCE')
   11 FORMAT(1H0,'ASSUMED VALUES OF ANALYSIS VARIABLES')
   12 FORMAT(1H0,'DESIGN:')
   13 FORMAT(1H ,'EXPRESSWAY TYPE.........................',2A4)
   14 FORMAT(1H ,'PAVEMENT TYPE.........................',3A4)
   15 FORMAT(1H ,'ANALYSIS SECTION LENGTH..............',F3.0,' MILES')
   16 FORMAT(1H ,'LANE WIDTH............................',F4.1,' FT.')
   17 FORMAT(1H,'ANALYSIS PERIOD.......................',I2,' YEARS')
   18 FORMAT(1H ,'DESIGN LIFE...........................',F4.1,' YEARS')
   19 FORMAT(1H ,'RESURFACED DESIGN LIFE...............',F3.0,' YEARS')
   20 FORMAT(1H ,'TERMINAL PSI VALUE.........................',F3.1)
   21 FORMAT(1H0,'TRAFFIC:')
   22 FORMAT(1H ,'INITIAL VOLUME......................',I6,' AADT')
   23 FORMAT(1H ,'INITIAL COMMERCIAL.................',F4.1,' PERCENT')
   24 FORMAT(1H ,'INITIAL AM PEAK SPLIT.............',F4.1,' PERCENT')
   25 FORMAT(1H ,'FINAL VOLUME........................',I6,' AADT')
   26 FORMAT(1H ,'FINAL COMMERCIAL..................',F4.1,' PERCENT')
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27 FORMAT(1H ,'FINAL AM PEAK SPLIT...............',F4.1,' PERCENT')
28 FORMAT(1H ,'NORMAL CAPACITY..................',F5.0,' VEHICLES')
29 FORMAT(1H ,'1 LANE CLOSED CAPACITY..........',F5.0,' VEHICLES')
30 FORMAT(1H ,'2 LANE CLCSED CAPACITY..........',F5.0,' VEHICLES')
31 FORMAT(1H ,'3 LANE CLOSED CAPACITY..........',F5.0,' VEHICLES')
32 FORMAT(1H ,'4 LANE CLCSED CAPACITY..........',F5.0,' VEHICLES')
33 FORMAT(1H0,'THE AVERAGE WEIGHT OF A CCMMERCIAL VEHICLE IS',
  XF4.0,' KIPS')
34 FORMAT(1H ,'THE MAXIMUM ANNUAL 18-KIP AXLES WITHOUT ADJUSTMENT',
  X'IS',I8)
35 FORMAT(1H0,'HOURLY DISTRIBUTION OF TRAFFIC')
36 FORMAT(1H0,'INITIAL YEAR:')
37 FORMAT(1H0,25X,'AM PEAK DIRECTION',39X'PM PEAK DIRECTION')
38 FORMAT(1H ,'HOUR',2('    WORK   SC-REC  PR BUS   VAC.   SCHOOL',
  X'   COM.      ALL'))
39 FORMAT(1H ,116('-'))
40 FORMAT(1H ,I3,1X,14F8.3)
41 FORMAT(1H0,'YEARLY INCREMENT:')
42 FORMAT(1H0,'MAINTENANCE:')
43 FORMAT(1H0,' VARIABLE  ',45X,'ACTIVITIES CODE NUMBER')
44 FORMAT(1H ,'DESCRIPTICN',17X,7I10)
45 FORMAT(1H ,101('-'))
46 FORMAT(1H ,'WORK LOCATION SPACING..........',7F10.2)
47 FORMAT(1H ,'WORKLCAD MODEL FACTOR..........',7F10.2)
48 FORMAT(1H ,'SIMULATICN WORKLOAD............',7F10.2)
49 FORMAT(1H ,'WORKLCAD OVERRIDE..............',7F10.2)
50 FORMAT(1H ,'MAINTENANCE LEVEL..............',7F10.2)
51 FORMAT(1H ,'TRAVEL TIME IN HOURS...........',7F10.2)
52 FORMAT(1H ,'CURE TIME IN HOURS.............',7F10.2)
53 FORMAT(1H ,'TRAFFIC CONTROL HOURS..........',7F10.2)
54 FORMAT(1H ,'MAXIMUM ZONE LENGTH IN MILES...',7F10.2)
55 FORMAT(1H ,'MINIMUM ZONE LENGTH IN MILES...',7F10.2)
56 FORMAT(1H ,'ALLOWED CONTINUOUS CREW HOURS..',7F10.2)
57 FORMAT(1H ,'ALLOWABLE VOLUME CAPACITY RATIO',7F10.2)
58 FORMAT(1H0,'PERFORMANCE STANDARDS:')
59 FORMAT(1H ,'TRAVEL SPEED BETWEEN SITES..........',F3.0,' MPH')
60 FORMAT(1H ,'WALK SPEED BETWEEN SITES............',F3.0,' MPH')
61 FORMAT(1H0,25X,'C O N C R E T E',18X,'B I T U M I N O U S',
  X18X,'C O M P O S I T E')
62 FORMAT(1H ,'ACTIVITY    ',3(7X,'UNIT COST',9X,'PRODUCTION'))
63 FORMAT(1H ,'  CODE    ',3(6X,'LAB+EQUIP  MATERIAL',6X,'RATE'))
64 FORMAT(1H ,120('-'))
65 FORMAT(1H ,I5,5X,9F12.2)
66 FORMAT(1H0,'MOTORIST COSTS')
67 FORMAT(1H0,26X,'FUEL',9X,'OIL',8X,'TREAD WEAR')
68 FORMAT(1H ,24X,'$/GALLCN',5X,'$/QUART',5X,'$/.001 INCH')
69 FORMAT(1H ,'PASSENGER CARS',10X,F5.2,8X,F5.2,2(9X,F5.2))
70 FORMAT(1H ,'CCMMERCIAL VEHICLES',5X,F5.2,8X,F5.2,2(9X,F5.2))
71 FORMAT(1H0,'TOTAL OPERATING COSTS IN DOLLARS/1,000 VEHICLE HOURS',
  X':')
72 FORMAT(1H0,2('SPEED     PASSENGER     COMMERCIAL      '))
73 FORMAT(1H ,2(13X,'CARS',8X,'VEHICLES',6X))
74 FORMAT(1H ,73('-'))
75 FORMAT(1H ,2(I4,7X,F6.0,8X,F6.0,8X))
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 76 FORMAT(1H0,'VALUE OF TIME SAVED IN DOLLARS/HOUR:')
 77 FORMAT(1H0,'COMMERCIAL VEHICLES = 8.72')
 78 FORMAT(1H0,2('MINUTES    WORK   SOC-REC   PER BUS   VAC.',
   X'   SCHOOL',6X))
 79 FORMAT(1H ,' SAVED',52X,'SAVED')
 80 FORMAT(1H ,110('-'))
 81 FORMAT(1H ,2(I5,F10.2,F9.2,F10.2,2F8.2,7X))
 82 FORMAT(1H ,'SHOULDER CAPACITY................',F5.0,' VEHICLES')
 83 FORMAT(1H ,'DETOUR CAPACITY..................',F5.0,' VEHICLES')
 84 FORMAT(1H0,'AVERAGE INCOME LEVEL OF MOTORIST............',I2)
 85 FORMAT(1H ,'OCCUPANTS PER VEHICLE ON WORK TRIPS.......',F4.1)
 86 FORMAT(1H ,'OCCUPANTS PER VEHICLE ON SCHOOL TRIPS.....',F4.1)
 87 FORMAT(1H ,'  V/C    RATIO  ',5X,50('-'))
 88 FORMAT(1H0,'CLOSURE CATEGORY',5I10)
 89 FORMAT(1H ,'SHOULDERS OPEN TO TRAFFIC......',7F10.2)
 90 FORMAT(1H ,'WORKSITE SWITCH................',7F10.2)
 91 FORMAT(1H ,'WORKSITE MULTIPLIER............',7F10.2)
 92 FORMAT(1H ,'WORKSITE SIZE ADD ON...........',7F10.2)
 93 FORMAT(1H ,'NUMBER OF ITERATIONS...........',7F10.2)
 94 FORMAT(1H ,'WORKSITE SPACING SWITCH........',7F10.2)
 95 FORMAT(1H ,'DISTANCE BETWEEN INTERCHANGES.......',F5.2,' MILES')
 96 FORMAT(1H ,'DETOUR LENGTH.......................',F5.2,' MILES')
 97 FORMAT(1H ,'SPEED LIMIT ON DETOUR...............',F5.2,' MPH')
 98 FORMAT(1H ,'NORMAL DETOUR VOLUME................',F5.2,' ADT')
100 FORMAT(1H ,'AVERAGE STOPS ON DETOUR.............',F5.2)
101 FORMAT(1H ,'DETOUR DIRECTIONAL LANES............',F5.2)
102 FORMAT(1H ,'1 LANE CLOSED SPEED LIMIT...........',F5.2,' MPH')
103 FORMAT(1H ,'2 LANE CLOSED SPEED LIMIT...........',F5.2,' MPH')
104 FORMAT(1H ,'3 LANE CLOSED SPEED LIMIT...........',F5.2,' MPH')
105 FORMAT(1H ,'4 LANE CLOSED SPEED LIMIT...........',F5.2,' MPH')
106 FORMAT(1H ,'FREEWAY SPEED LIMIT.................',F5.2,' MPH')
107 FORMAT(1H ,I4,24X,7I10)
108 FORMAT(1H ,I3,3F12.4)
109 FORMAT(1H0,'NO',3X,' FULL DEPTH    PARTIAL   , LOCATION  ')
110 FORMAT(1H0,F10.2,7X,5F10.2)
111 FORMAT(1H0,'AVAILABLE OCCUPANCY HOURS INDICATED BY 1')
112 FORMAT(1H0,'RANDOM ARRAYS')
113 FORMAT(1H0,41X,'SPEED (MPH)')
    WRITE(MO,10)
    WRITE(MO,111)
    WRITE(MO,44)(J,J=1,7)
    WRITE(MO,45)
    DO 1925 IH=1,24
    WRITE(MO,107)IH,(IHOUR(IH,J),J=1,7)
1925 CONTINUE
    WRITE(MO,10)
    WRITE(MO,112)
    WRITE(MO,109)
    DO 1980 IW=1,1000,20
    WRITE(MO,108)IW,PATCHF(IW),PATCHP(IW),RLOC(IW)
1980 CONTINUE
    WRITE(MO,10)
    WRITE(MO,11)
    WRITE(MO,12)
```

```
      WRITE(MO,13)(ROAD(J,KP),J=1,2)
      WRITE(MO,14)(PAVE(ITYPE,J),J=1,3)
      WRITE(MO,15)PROJLN
      WRITE(MO,16)WIDTH
      WRITE(MO,17)NYEARS
      WRITE(MO,18)DLIFE
      WRITE(MO,19)RLIFE
      WRITE(MO,20)PSIRS
      WRITE(MO,21)
      ITEST=(VOLUME(1)+VOLUME(2))*1000
      WRITE(MO,22)ITEST
      TEMP1=TRUCKS(1)+TRUCKS(2)
      WRITE(MO,23)TEMP1
      TEMP2=SPLIT(1)+SPLIT(2)
      WRITE(MO,24)TEMP2
      ITEST=ITEST+VOLUME(2)*(NYEARS-1)*1000
      WRITE(MO,25)ITEST
      TEMP1=TEMP1+TRUCKS(2)*(NYEARS-1)
      WRITE(MO,26)TEMP1
      TEMP2=TEMP2+SPLIT(2)*(NYEARS-1)
      WRITE(MO,27)TEMP2
      I=LANES+1
      TEMP1=CAP(I)*1000
      WRITE(MO,28)TEMP1
      TEMP1=CAP(1)*1000
      WRITE(MO,29)TEMP1
      GOTO(1900),KP
      TEMP1=CAP(2)*1000
      WRITE(MO,30)TEMP1
      GOTO(1900,1900),KP
      TEMP1=CAP(3)*1000
      WRITE(MO,31)TEMP1
 1900 CONTINUE
      TEMP1=CAP(LANES)*1000
      WRITE(MO,82)TEMP1
      TEMP1=DETOUR(5)*1000
      WRITE(MO,83)TEMP1
      WRITE(MO,95)DETOUR(1)
      WRITE(MO,96)DETOUR(2)
      WRITE(MO,97)DETOUR(3)
      WRITE(MO,98)DETOUR(4)
      WRITE(MO,100)DETOUR(6)
      WRITE(MO,101)DETOUR(7)
      WRITE(MO,106)SLIMIT(LANES+1)
      WRITE(MO,102)SLIMIT(1)
      WRITE(MO,103)SLIMIT(2)
      WRITE(MO,104)SLIMIT(3)
      WRITE(MO,105)SLIMIT(4)
      WRITE(MO,33)CWT
      ITEST=ARHO*1000000
      WRITE(MO,34)ITEST
      WRITE(MO,10)
      WRITE(MO,113)
      WRITE(MO,88)(J,J=1,5)
      N=LANES+1
```

```
      WRITE(MO,88)(J,J=1,N)
      WRITE(MO,87)
      DO 1950 I=1,11
      VC=(I-1)*.1
 1950 WRITE(MO,110)VC,(SP(J,I),J=1,N)
      WRITE(MO,10)
      WRITE(MO,35)
      WRITE(MO,36)
      WRITE(MO,37)
      WRITE(MO,38)
      WRITE(MO,39)
      DO 1910 IH=1,24
      WRITE(MO,40)IH,(PCTADT(IH,J,1,1),J=1,7),(PCTADT(IH,J,2,1),J=1,7)
 1910 CONTINUE
      WRITE(MO,41)
      DO 1911 IH=1,24
      WRITE(MO,40)IH,(PCTADT(IH,J,1,2),J=1,7),(PCTADT(IH,J,2,2),J=1,7)
 1911 CONTINUE
      WRITE(MO,10)
      WRITE(MO,11)
      WRITE(MO,42)
      WRITE(MO,43)
      WRITE(MO,44)(J,J=1,7)
      WRITE(MO,45)
      WRITE(MO,46)(OVER(2,J),J=1,7)
      WRITE(MO,47)(OVER(3,J),J=1,7)
      WRITE(MO,48)(SWORK(J),J=1,7)
      WRITE(MO,49)(OVER(4,J),J=1,7)
      WRITE(MO,50)(OVER(6,J),J=1,7)
      WRITE(MO,51)(OVER(5,J),J=1,7)
      WRITE(MO,52)(OVER(7,J),J=1,7)
      WRITE(MO,53)(OVER(8,J),J=1,7)
      WRITE(MO,54)(OVER(9,J),J=1,7)
      WRITE(MO,55)(OVER(11,J),J=1,7)
      WRITE(MO,56)(OVER(1,J),J=1,7)
      WRITE(MO,57)(OVER(10,J),J=1,7)
      WRITE(MO,89)(OVER(12,IA),IA=1,7)
      WRITE(MO,90)(SIM(IA,1),IA=1,7)
      WRITE(MO,91)(SIM(IA,2),IA=1,7)
      WRITE(MO,92)(SIM(IA,3),IA=1,7)
      WRITE(MO,93)(SIM(IA,4),IA=1,7)
      WRITE(MO,94)(SIM(IA,5),IA=1,7)
      WRITE(MO,58)
      WRITE(MO,59)TCMOVE
      WRITE(MO,60)WALK
      WRITE(MO,61)
      WRITE(MO,62)
      WRITE(MO,63)
      WRITE(MO,64)
      DO 1920 IA=1,7
      WRITE(MO,65)IA,(PS(IA,1,J),J=1,3),(PS(IA,2,J),J=1,3),
     X(PS(IA,3,J),J=1,3)
 1920 CONTINUE
      WRITE(MO,10)
```

```
      WRITE(MO,66)
      WRITE(MO,67)
      WRITE(MO,68)
      WRITE(MO,69)FUEL(1),OIL(1),TIRES(1)
      WRITE(MO,70)FUEL(2),OIL(2),TIRES(2)
      WRITE(MO,71)
      WRITE(MO,72)
      WRITE(MO,73)
      WRITE(MO,74)
      DO 1930 I=1,32
      IS=I+32
      WRITE(MO,75)I,(OCOSTS(I,J),J=1,2),IS,(OCOSTS(IS,J),J=1,2)
 1930 CONTINUE
      WRITE(MO,10)
      WRITE(MO,66)
      WRITE(MO,84)INC
      WRITE(MO,85)OCWORK
      WRITE(MO,86)OCSCHL
      WRITE(MO,76)
      WRITE(MO,77)
      WRITE(MO,78)
      WRITE(MO,79)
      WRITE(MO,80)
      DO 1940 I=1,20
      IT=I+20
      WRITE(MO,81)I,(VTRATE(J,I),J=1,5),IT,(VTRATE(J,IT),J=1,5)
 1940 CONTINUE
      RETURN
      END
```

```
C
C*********************************************************************C
C*********************************************************************C
C******************                                    ***************C
C******************         SUBROUTINE   YEAR          ***************C
C******************                                    ***************C
C******************         PROGRAM 'EAROMAR'          ***************C
C******************                                    ***************C
C******************                                    ***************C
C*********************************************************************C
C*********************************************************************C
C*********************************************************************C
C
C
      SUBROUTINE YEAR
      INTEGER COSTS(7,5,8,2)
      COMMON           ARHO,           CAP(5),         COSTS,
     1 CWT,            DVOL(24),       HVOL(24),       ID,
     2 IHOUR(24,7),    ITYPE,          IY,             KP,
     3 LANES,          MI,             MO,             NYEARS,
     4 OCOSTS(65,2),   PATCHF(1000),   PATCHP(1000),   PROJLN,
     5 RLOC(1000),     SIM(7,5),       SP(5,11),       SPEEDD(24),
     6 SPEEDN(24),     SPLIT(2),       SWORK(7),       TRUCKS(2),
     7 VOLUME(2),      VTRATE(5,40),   ZONEL(7,4)
      COMMON/ASSUME/   ALIGN(3,6),     AACOST,         COMVOT,
     1 DETOUR(7),      DLIFE,          FUEL(2),        HRS(7,24,4),
     2 HWORK(7),       IDIR,           INC,            IPRINT,
     3 IWT,            JPRINT,         OCSCHL,         OCWORK,
     4 OIL(2),         OVER(12,7),     PCTADT(24,7,2,2),PS(7,3,3),
     5 PSIRS,          RATEI,          RLIFE,          SINDEX,
     6 SLIMIT(5),      TCMOVE,         TIRES(2),       TLEVEL(7),
     7 WALK,           WIDTH,          WEIGHT(10,3)
      INTEGER TOTALA(8),TOTALY(8)
      DIMENSION ITOTAL(5,8,2)
      DIMENSION DIRECT(2,3)
      DATA DIRECT/' AM ','PEAK',' PM ','PEAK','COMB','INED'/
      DO 2001 I=1,8
      TOTALA(I)=0
 2001 CONTINUE
      PSIASN=4.5
      RAGE=0
      AAXLES=0
C
C
C
C  ***THIS ANALYSIS IS PERFORMED FOR NYEARS
C
C
C
      DO 2000 IY=1,NYEARS
C
C***  INCREMENT VOLUME FOR EACH YEAR
      VOLUME(1)=VOLUME(1)+VOLUME(2)
C
```

```
C  ***DETERMINE THE ANNUAL COMMERCIAL TRAFFIC 18 KIP AXLE LOADINGS
      AAXLES=AAXLES+CVOL*.365*.735/2
C
C  ***ANALYSIS AGE IS EQUAL TO ANAYSIS YEAR MINUS PAVEMENT RESURFACED YEAR
 2323 AGE=IY-RAGE
C
C  ***TEST THE PREDICTED ACCUMULATED AXLES AGAINIST ACTUAL ACCUMULATED AXLES
      IF(AGE*ARHO.GT.AAXLES)GOTO 2326
C
C  ***BASE ANALYSIS AGE ON ACTUAL AXLES
      AGE=AAXLES/ARHO
C
C  ***COMPUTE PSI,PSIASN=INITIAL PSI, DLIFE=DESIGN LIFE,AGE=ANALYSIS AGE
 2326 PSI=PSIASN-(((PSIASN-1.5)/DLIFE)*AGE)
 2349 CONTINUE
C
C  ***ANALYSIS AGE IS ASSUMED RELATED TO LINEAR LOSS IN PSI OVER 20 YEARS
      AGE=20*(PSIASN-PSI)/(PSIASN-1.5)
C
C
C  ***TEST PSI TO DETERMINE IF PAVEMENT SHOULD BE RESURFACED
C  ***IF PAVEMENT IS DUE FOR RESURFACING SET MAINTENANCE LEVEL EQUAL TO 1
C
      IF(PSI.LE.PSIRS)OVER(6,7)=1
C
C
C  ***DEVELOPMENT OF ANNUAL WORKLOAD FOR ACTIVITIES
C
C
C  ***DETERMINE THE TYPE OF ROADWAY,CONCRETE,BITUMINOUS OR COMPOSITE
      GOTO (2101,2102,2103),ITYPE
C
C
C   **CONCRETE WORKLOAD ANALYSIS
C
C
 2101 CONTINUE
C
C  ***GET EACH ACTIVITY
      DO 2104 IA=1,7
C
C  ***INITIALIZE WORK A TEMPORARY VARIABLE TO HOLD ANNUAL WORKLOAD BY ACTIVITY
      WORK=0
C
C  ***TEST TO SEE IF MAINTENANCE LEVEL IS ZERO MEANING NO WORKLOAD
      IF(OVER(6,IA).EQ.0)GOTO 2104
C
C  ***BRANCH TO THE APPROPRIATE ACTIVITY MODEL
      GOTO (2120,2125,2130,2135,2140,2108,2195),IA
C
C  ***FULL DEPTH CONCRETE PATCHING MODEL
 2120 WORK=OVER(3,IA)*34*(1/(1+EXP(-1*((AGE-10)/1.25))))
      GOTO 2108
C
```

```
C***   INCREMENT % COMMERCIAL FOR EACH YEAR
       TRUCKS(1)=TRUCKS(1)+TRUCKS(2)
C
C***   INCREMENT AM AND PM DIRECTIONAL SPLIT FOR EACH YEAR
       SPLIT(1)=SPLIT(1)+SPLIT(2)
       DO 2010 ID=1,2
       DO 2011 IT=1,7
       DO 2012 IH=1,24
C
C***   INCREMENT DISTRIBUTION OF TRAFFIC FOR EACH YEAR
       PCTADT(IH,IT,ID,1)=PCTADT(IH,IT,ID,1)+PCTADT(IH,IT,ID,2)
 2012  CONTINUE
       N=LANES+1
       DO 2020 IC=1,N
       DO 2021 I=1,8
C
C***   INITIALIZE COSTS TO ZERO FOR EACH YEAR
       COSTS(IT,IC,I,ID)=0
 2021  CONTINUE
 2020  CONTINUE
 2011  CONTINUE
 2010  CONTINUE
C
C
C      SUBROUTINE AWORKL
C   ***NOTE: OPTION TO TRANSFER
C   ***        1. PSI VALUE,'PSI' OR
C   ***        2. ACCUMULATED 18 KIP AXLES,'AXLE'
C
C
C   ***DETERMINE THE PSI AND ANALYSIS AGE FOR YEAR
C
C   ***INITIALIZE THE PRESENT SERVICEABILITY INDEX TO ZERO EACH YEAR
       PSI=0
C
C   ***TEST TO DETERMINE IF A PSI HAS BEEN TRANSFERED FROM A CALLING PROGRAM
C
       IF(PSI.EQ.0)GOTO 2310
       GOTO 2349
C
C   ***INITIALIZE THE TRANSFER ACCUMULATED 18 KIP VARIABLE TO ZERO
 2310  AXLE=0
C
C   ***TEST TO DETERMINE IF 'AXLE' HAS BEEN TRANSFERED FROM A CALLING PROGRAM
C
       IF(AXLE.EQ.0)GOTO 2320
C
C   ***ASSIGN TRANSFERED VALUE FOR AXLE TO VARIABLE FOR ACCUMULATED 18 KIP AXLES
       AAXLES=AXLE
       GOTO 2323
C
C   ***DETERMINE THE DAILY COMMERCIAL TRAFFIC VOLUME FOR ANALYSIS YEAR
 2320  CVOL=TRUCKS(1)*VOLUME(1)/100
C
```

```
C   ***PARTIAL DEPTH CONCRETE PATCHING
 2125 WORK=HWORK(1)
C
C   ***IT IS ASSUMED THAT PARTIAL DEPTH PATCHING CANNOT EXCEED ONE CUBIC YARD
      IF(WORK.GT.1)WORK=1.
C   ***DEDUCT PARTIAL DEPTH PATCHING FROM ACCUMULATED FULL DEPTH PATCHING
      HWORK(1)=HWORK(1)-WORK
C
C   ***FACTOR WORKLOAD IF APPLICABLE
      WORK=WORK*OVER(3,IA)
C
C   ***TEST FOR OVERRIDE WORKLOAD RATE
      IF(OVER(4,IA).NE.0)WORK=OVER(4,IA)
C
C   ***CONVERT PARTIAL PATCHING TO SQUARE FEET AND ACCUMULATE
      HWORK(IA)=HWORK(IA)+WORK*9
C
      GOTO 2104
C
C   ***CONCRETE BLOWUPS
C
C   ***ASSUMED THAT THERE ARE NO BLOWUPS PRIOR TO FIFTH YEAR
 2130 IF(IY.LT.5)GOTO 2104
C
C   ***IT IS ASSUMED THAT THERE WILL BE NO BLOWUPS AFTER 25 YEARS
      IF(IY.GT.25)GOTO 2104
C
C   ***BLOWUP MODEL FOR BETWEEN 5 AND 25 YEARS
 2131 WORK=.005*(IY-4)*OVER(3,IA)
      GOTO 2108
C
C   ***JOINT SEALING MODEL
 2135 WORK=5280/OVER(2,IA)*WIDTH*OVER(6,IA)*OVER(3,IA)
      GOTO 2108
C
C   ***TEMP3 IS THE PORTION OF THE TOTAL MUDJACKING TO BE DONE EACH YEAR
 2140 TEMP3=.25*(.5*IY)**2*EXP(-.5*IY)
C
C   ***ANNUAL MUDJACKING LOCATIONS
      WORK=TEMP3*52.8/OVER(2,IA)*OVER(3,IA)
C
C   ***OVER RIDE WORKLOAD RATE FOR ANY ACTIVITY
 2108 IF(OVER(4,IA).NE.0)WORK=OVER(4,IA)
C
C   ***ACCUMULATED WORKLOAD FOR ANY ACTIVITY
      HWORK(IA)=HWORK(IA)+WORK
 2104 CONTINUE
      GOTO 2199
C
C
C   ***BITUMINOUS WORKLOAD ANALYSIS
C
C
 2102 CONTINUE
```

```
C
C   ***GET EACH ACTIVITY
       DO 2105 IA=1,7
C   ***INITIALIZE WORK A TEMPORARY VARIABLE TO HOLD ANNUAL WORKLOAD BY ACTIVITY
       WORK=0
C
C   ***TEST TO SEE IF MAINTENANCE LEVEL IS ZERO MEANING NO WORKOAD
       IF(OVER(6,IA).EQ.0)GOTO 2105
C
C   ***BITUMINOUS WORKLOAD AGE FACTOR MODEL
       FACT1=(1/(1+EXP((-AGE+10)/1.16)))
C
C   ***BRANCH TO THE APPROPRIATE ACTIVITY MODEL
C
       GOTO(2150,2155,2160,2109,2109,2109,2195),IA
C
C   ***BITUMINOUS PATCHING WORKLOAD
 2150  WORK=FACT1*1100*OVER(3,IA)
       GOTO 2109
C
C   ***CRACKSEALING WORKLOAD
 2155  WORK=FACT1*1000*OVER(3,IA)
       GOTO 2109
C
C   ***BITUMINOUS BASE AND SURFACE REPAIR WORKLOAD
 2160  WORK=FACT1*OVER(3,IA)*5
       GOTO 2109
 2109  CONTINUE
C
C   ***OVER RIDE WORKLOAD RATE FOR ANY ACTIVITY
       IF(OVER(4,IA).NE.0)WORK=OVER(4,IA)
C
C   ***ACCUMULATED WORKLOAD FOR ANY ACTIVITY
       HWORK(IA)=HWORK(IA)+WORK
 2105  CONTINUE
       GOTO 2199
C
C
C
C   ***COMPOSITE WORKLOAD ANALYSIS
C
C
C
 2103  CONTINUE
       FACT1=(1/(1+EXP((-AGE+10)/1.16)))
C
C   ***GET EACH ACTIVITY
C
       DO 2106 IA=1,7
C   ***INITIALIZE WORK A TEMPORARY VARIABLE TO HOLD ANNUAL WORKLOAD BY ACTIVITY
       WORK=0
C
C   ***TEST TO SEE IF MAINTENANCE LEVEL IS ZERO MEANING NO WORKLOAD
       IF(OVER(6,IA).EQ.0)GOTO 2106
```

```
C
C   ***BRANCH TO THE APPROPRIATE ACTIVITY MODEL
C
      GOTO(2170,2110,2180,2185,2190,2110,2195),IA
C
C   ***OVERLAY PATCHING MODEL
 2170 WORK=FACT1*1100*OVER(3,IA)
      GOTO 2110
C
C   ***OVERLAY BLOWUP MODEL
C
C   ***ASSUMED THAT THERE ARE NO BLOWUPS PRIOR TO FIFTH YEAR
 2180 IF(IY.LT.5)GOTO 2106
C
C   ***IT IS ASSUMED THAT THERE WIL BE NO BLOWUPS AFTER 25 YEARS
      IF(IY.GT.25)GOTO 2106
C
C
C   ***BLOWUP MODEL FOR BETWEEN 5 AND 25 YEARS
 2181 WORK=.005*(IY-4)*OVER(3,IA)
      GOTO 2110
C
C   ***CRACKSEALING MODEL
 2185 WORK=FACT1*1000*OVER(3,IA)
      GOTO 2110
C
C   ***TEMP3 IS THE PORTION OF THE TOTAL MUDJACKING TO BE DONE EACH YEAR
 2190 TEMP3=.25*(.5*IY)**2*EXP(-.5*IY)
C
C   ***ANNUAL MUDJACKING LOCATIONS
      WORK=TEMP3*52.8/OVER(2,IA)*OVER(3,IA)
      GOTO 2110
C
C   ***OVER RIDE WORKLOAD RATE FOR ANY ACTIVITY
C
 2110 IF(OVER(4,IA).NE.0)WORK=OVER(4,IA)
C   ***ACCUMULATED WORKLOAD FOR ANY ACTIVITY
      HWORK(IA)=HWORK(IA)+WORK
 2106 CONTINUE
      GOTO 2199
C   ***SET RAGE, THE YEAR OF PAVEMENT RESURFACING,EQUAL TO ANALYSIS YEAR
C
 2195 RAGE=IY
C
C   ***COMPUTE RESURFACING WORKLOAD
      HWORK(IA)=586.67*WIDTH*OVER(3,IA)
C
C   ***SET ACCUMULATED 18 KIP AXLES EQUAL TO ZERO
      AAXLES=0
C
C   ***RESET DESIGN LIFE TO RLIFE, THE RESURFACED DESIGN LIFE
      DLIFE=RLIFE
 2199 CONTINUE
C     RETURN
```

```
C      END
C
C
C
C   ***THIS IS A ROUTINE AT THE DIRECTION LEVEL
C
C
C
       DO 2030 ID=1,2
C
C   ***INITIALIZE TEMP1 FOR EXCESS VOLUME TO ZERO
       TEMP1=0
C
       DO 2031 IH=1,24
C
C   ***DETERMINE THE HOURLY TRAFFIC  VOLUME ON THE FREEWAY
       HVOL(IH)=VOLUME(1)*ABS(ID-1-SPLIT(1)/100)*PCTADT(IH,7,ID,1)
      X+TEMP1
C
C   ***DETERMINE NORMAL FREEWAY CAPACITY
       CAPACT=CAP(LANES+1)*(1-PCTADT(IH,6,ID,1))
C
C   ***TEST TO DETERMINE IF HOURLY VOLUME EXCEEDS NORMAL CAPACITY
C   ***AND IF IT DOES HOLD EXCESS IN TEMP1
       IF(HVOL(IH).GT.CAPACT)TEMP1=HVOL(IH)-CAPACT
C
C   ***LET THE HOURLY NORMAL VOLUME BE THE ACTUAL VOLUME LESS TEMP1
       HVOL(IH)=HVOL(IH)-TEMP1
C
C   ***DETERMIN V/C SUBSCRIPT
       I=(HVOL(IH)/CAPACT+.15)*10
C
C   ***ASSIGN A SPEED TO THE HOUR
       SPEEDN(IH)=SP(LANES+1,I)
C
C   ***DETERMINE THE HOURLY TRAFFIC VOLUME ON THE DETOUR
       DVOL(IH)=HVOL(IH)*DETOUR(4)/VOLUME(1)
C
C   ***DETERMINE NORMAL DETOUR CAPACTITY
       CAPACT=DETOUR(5)*(1-PCTADT(IH,6,ID,1))
C
C   ***DETERMINE  V/C SUBSCRIPT
       I=(DVOL(IH)/CAPACT+.15)*10
C
C   ***SUBSCRIPT CANNOT EXCEED ELEVEN
       IF(I.GT.11)I=11
C
C   ***ASSIGN A SPEED TO THE HOUR FOR DETOUR
       SPEEDD(IH)=SP(LANES,I)
 2031 CONTINUE
       CALL MAINT
       CALL MOTOR
 2030 CONTINUE
C
```

```
C  ***TEST FOR RESURFACED ROADWAY
      IF(OVER(6,7).NE.1)GOTO 2040
C
C  ***SET MAINTENANCE LEVEL EQUAL TO ZERO
      OVER(6,7)=0
C  ***RESET THE INITAIL PSI TO 3.6 , THIS IS 80% OF THE NEW PAVEMENT VALUE
      PSIASN=3.6
      DO 2035 IA=1,7
      HWORK(IA)=0
 2035 CONTINUE
      IF(ITYPE.NE.1)GOTO 2040
C
C  ***MAKE THE FOLLOWING CONVERSIONS FOR CONCRETE PAVEMENT
C  ***TO REFLECT THAT PAVEMENT TYPE IS NOW COMPOSITE
C
C  ***COMPOSITE PAVEMENT IS ITYPE=3
      ITYPE=3
C
C  ***SET THE MAINTENANCE LEVEL FOR PARTIAL DEPTH PARTCHING TO ZERO
      OVER(6,2)=0
C
C  ***SET THE SIMULATION FACTOR TO TEN FOR BITUMINOUS PATCHING
      SIM(1,2)=10
C
C  ***SET THE MAINTENANCE LEVEL FOR JOINT SEALING TO ANNUAL
      OVER(6,4)=1
 2040 CONTINUE
C
C  ***THIS IS A ROUTINE TO COMPUTE ACCUMULATED ACCIDENTS AND POLLUTION
      N=LANES+1
      DO 2050 ID=1,2
      DO 2051 IC=1,N
      DO 2052 IA=1,7
      COSTS(IA,IC,4,ID)=COSTS(IA,IC,3,ID)*100/AACOST
      COSTS(IA,IC,7,ID)=COSTS(IA,IC,7,ID)*100/(VOLUME(1)*PROJLN)
 2052 CONTINUE
 2051 CONTINUE
 2050 CONTINUE
C
C
C     SUBROUTINE PRINT
C
C
  101 FORMAT(1H1,25X,'TRAFFIC WARRENTS FOR PREMIUM PAVEMENTS ',
     X'REQUIRING REDUCED MAINTENANCE')
  102 FORMAT(1H ,25X,'ANALYSIS YEAR:',I4,31X,'DIRECTION ',2A4)
  103 FORMAT(1H0,'ACTIVITY    CLOSURE   MAINTENANCE &     OPERATION',
     X10X,'ACCIDENTS',11X,'LOSS TIME',7X,'POLLUTION',9X,'TOTAL')
  104 FORMAT(1H ,' NUMBER    CATEGORY   REHABILITATION      COSTS    ',
     X'      COSTS     #X100',5X,'COSTS      HOURS     .01 DAYS',9X,
     X'COSTS')
  105 FORMAT(1H ,119('-'))
  106 FORMAT(1H ,I4,I11,8X,'$',I9,7X,'$',I8,5X,'$',2I7,3X,'$',I8,I9,
     XI11,8X,'$',I09)
```

```
  107 FORMAT(1H ,2X,'TOTAL',I8,8X,'$',I9,7X,'$',I8,5X,'$',2I7,3X,'$',
     XI8,I9,I11,8X,'$',I09)
  108 FORMAT(1H ,'MINIMUM COSTS      ',5X,'$',I9,7X,'$',I8,5X,'$',2I7,
     X3X,'$',I8,I9,I11,8X,'$',I09)
  109 FORMAT(1H ,'DISCOUNTED COSTS  ',5X,'$',I9,7X,'$',I8,5X,'$',2I7,
     X3X,'$',I8,I9,I11,8X,'$',I09)
  110 FORMAT(1H ,'ACCUMULATED COSTS ',5X,'$',I9,7X,'$',I8,5X,'$',2I7,
     X3X,'$',I8,I9,I11,8X,'$',I09)
  111 FORMAT(1H )
  112 FORMAT(1H0,'                    MAINTENANCE &     OPERATION',
     X10X,'ACCIDENTS',11X,'LOSS TIME',7X,'POLLUTION',9X,'TOTAL')
  113 FORMAT(1H ,'                    REHABILITATION      COSTS    ',
     X'      COSTS    #X100',5X,'COSTS       HOURS      .01 DAYS',9X,
     X'COSTS')
  115 FORMAT(1H0,'*** SIGNIFIES THAT ROAD CANNOT BE OCCUPIED WITHIN',
     X' V/C CONSTRAINTS')
      DO 5100 I=1,8
      DO 5101 ID=1,2
      N=LANES+1
      DO 5102 IC=1,N
      ITOTAL(IC,I,ID)=0
 5102 CONTINUE
 5101 CONTINUE
      TOTALY(I)=0
 5100 CONTINUE
      DO 5110 ID=1,2
      DO 5111 IA=1,7
      I=1
      N=LANES+1
C
C  ***ACCUMULATE TOTAL COST BY ACTIVITY AND CLOSURE AND
C  ***ACCUMULATE TOTALS FOR EACH COST ITEM BY CLOSURE
      DO 5112 IC=1,N
      COSTS(IA,IC,8,ID)=COSTS(IA,IC,5,ID)
      DO 5113 K=1,3
      COSTS(IA,IC,8,ID)=COSTS(IA,IC,8,ID)+COSTS(IA,IC,K,ID)
      ITOTAL(IC,K,ID)=ITOTAL(IC,K,ID)+COSTS(IA,IC,K,ID)
 5113 CONTINUE
      DO 5114 K=4,8
      ITOTAL(IC,K,ID)=ITOTAL(IC,K,ID)+COSTS(IA,IC,K,ID)
 5114 CONTINUE
C
C  ***HOLD LANE CLOSURE SUBSCRIPT FOR MINIMUM COST
      IF(COSTS(IA,IC,8,ID).LT.COSTS(IA,I,8,ID))I=IC
 5112 CONTINUE
C
C  ***ACCUMULATE AND HOLD MINIMUM COST
      DO 5115 K=1,8
      TOTALY(K)=TOTALY(K)+COSTS(IA,I,K,ID)
 5115 CONTINUE
 5111 CONTINUE
 5110 CONTINUE
C
C  ***TEST FOR PRINT LEVEL
```

```
C   ***      1. DIRECTION DETAIL
C   ***      2. YEAR DETAIL
C   ***      3. YEAR SUMMARY
C   ***      4. ANALYSIS SUMMARY
      GOTO(5010,5020,5000,5000),IPRINT
C
C   ***DIRECTION DETAIL PRINT ROUTINE
 5010 CONTINUE
      DO 5011 ID=1,2
      IP1=0
 5014 WRITE(MO,101)
      WRITE(MO,102)IY,(DIRECT(J,ID),J=1,2)
      IF(ID.GT.2)ID=1
      WRITE(MO,103)
      WRITE(MO,104)
      WRITE(MO,105)
      DO 5012 IA=1,7
      N=LANES+1
      DO 5013 IC=1,N
      WRITE(MO,106)IA,IC,(COSTS(IA,IC,J,ID),J=1,8)
 5013 CONTINUE
 5012 CONTINUE
      WRITE(MO,105)
      WRITE(MO,111)
      N=LANES+1
      DO 5015 IC=1,N
      WRITE(MO,107)IC,(ITOTAL(IC,J,ID),J=1,8)
 5015 CONTINUE
      WRITE(MO,111)
      WRITE(MO,111)
      WRITE(MO,115)
 5011 CONTINUE
C
C   ***YEAR DETAIL PRINT ROUTINE
 5020 CONTINUE
      WRITE(MO,101)
      WRITE(MO,102)IY,(DIRECT(J,3),J=1,2)
      WRITE(MO,103)
      WRITE(MO,104)
      WRITE(MO,105)
      DO 5021 IA=1,7
      N=LANES+1
      DO 5022 IC=1,N
      DO 5023 J=1,8
      COSTS(IA,IC,J,1)=COSTS(IA,IC,J,1)+COSTS(IA,IC,J,2)
 5023 CONTINUE
      WRITE(MO,106)IA,IC,(COSTS(IA,IC,J,1),J=1,8)
 5022 CONTINUE
 5021 CONTINUE
      WRITE(MO,105)
      WRITE(MO,111)
      N=LANES+1
      DO 5024 IC=1,N
      DO 5025 J=1,8
```

```
      ITOTAL(IC,J,1)=ITOTAL(IC,J,1)+ITOTAL(IC,J,2)
 5025 CONTINUE
      WRITE(MO,107)IC,(ITOTAL(IC,J,1),J=1,8)
 5024 CONTINUE
      WRITE(MO,105)
      GOTO 5026
C
C  ***SUMMARY HEADER PRINT ROUTINE
 5000 CONTINUE
C
C  ***PRINT SUMMARY HEADER ONLY ONCE
      GOTO(5027,5026),IY
      GOTO 5026
 5027 WRITE(MO,101)
      WRITE(MO,112)
      WRITE(MO,113)
      WRITE(MO,105)
      WRITE(MO,111)
 5026 CONTINUE
C
C  ***TEST FOR YEARLY SUMMARY PRINT
 5028 IF(IPRINT.GT.3)GOTO 5029
      WRITE(MO,111)
      WRITE(MO,108)(TOTALY(J),J=1,8)
C
C  ***DISCOUNT MINIMUM COSTS
 5029 CONTINUE
      A=(1+RATEI)**IY
      TOTALY(1)=TOTALY(1)/A
      TOTALY(2)=TOTALY(2)/A
      TOTALY(3)=TOTALY(3)/A
      TOTALY(5)=TOTALY(5)/A
      TOTALY(8)=TOTALY(8)/A
C
C  ***ACCUMULATE DISCOUNTED COSTS
      DO 5030 J=1,8
      TOTALA(J)=TOTALA(J)+TOTALY(J)
 5030 CONTINUE
C
C  ***TEST FOR YEARLY SUMMARY PRINT
      IF(IPRINT.GT.3)GOTO 2000
      WRITE(MO,109)(TOTALY(J),J=1,8)
      WRITE(MO,110)(TOTALA(J),J=1,8)
      WRITE(MO,105)
 5031 CONTINUE
 2000 CONTINUE
C
C  ***PRINT ANALYSIS SUMMARY
      WRITE(MO,110)(TOTALA(J),J=1,8)
C     RETURN
      RETURN
      END
```

```
C
C
C***********************************************************************
C***********************************************************************
C******************                                      ***************
C******************          SUBROUTINE MAINT            ***************
C******************                                      ***************
C******************          PROGRAM 'EAROMAR'           **************
C******************                                      ***************
C***********************************************************************
C***********************************************************************
C***********************************************************************
C
      SUBROUTINE MAINT
      INTEGER COSTS(7,5,8,2)
      COMMON             ARHO,             CAP(5),            COSTS,
     1 CWT,              DVOL(24),         HVOL(24),          ID,
     2 IHOUR(24,7),      ITYPE,            IY,                KP,
     3 LANES,            MI,               MO,                NYEARS,
     4 OCOSTS(65,2),     PATCHF(1000),     PATCHP(1000),      PROJLN,
     5 RLOC(1000),       SIM(7,5),         SP(5,11),          SPEEDD(24),
     6 SPEEDN(24),       SPLIT(2),         SWORK(7),          TRUCKS(2),
     7 VOLUME(2),        VTRATE(5,40),     ZONEL(7,4)
      COMMON/ASSUME/     ALIGN(3,6),       AACOST,            COMVOT,
     1 DETOUR(7),        DLIFE,            FUEL(2),           HRS(7,24,4),
     2 HWORK(7),         IDIR,             INC,               IPRINT,
     3 IWT,              JPRINT,           OCSCHL,            OCWORK,
     4 OIL(2),           OVER(12,7),       PCTADT(24,7,2,2),PS(7,3,3),
     5 PSIRS,            RATEI,            RLIFE,             SINDEX,
     6 SLIMIT(5),        TCMOVE,           TIRES(2),          TLEVEL(7),
     7 WALK,             WIDTH,            WEIGHT(10,3)
C
      DIMENSION CREWH(4),JHOUR(24),NOTIME(4)
      DO 3010 IA=1,7
C  ***TEST TO DETERMINE IF THERE IS ANY WORKLOAD
      IF(HWORK(IA).EQ.0)GOTO 3010
C
C***  DETERMINE A FACTOR FOR THE LEVEL OF MAINTENANCE
C***  THE LEVEL OF MAINTENANCE FACTOR MUST BE AN INTEGER NUMBER
      NA=OVER(6,IA)
C
C***  TEST TO DETERMINE IF WORKLOAD WILL BE DONE AT LEAST ONCE IN YEAR
      IF(NA.GE.1)GOTO 3021
C
C  ***ACCUMULATE MAINTENANCE LEVEL IN FIRST DIRECTION
      IF(ID.EQ.1)TLEVEL(IA)=TLEVEL(IA)+OVER(6,IA)+.001
C
C***  TEST TO DETERMINE IF ACTIVITY WILL BE PERFORMED IN ANALYSIS YEAR
      IF(TLEVEL(IA).LT.1)GOTO 3010 .
C
C***  RESET THE ACCUMULATED MAINTENANCE LEVEL VARIABLE BECAUSE WORK EXECUTED
      IF(ID.EQ.2)TLEVEL(IA)=0
C
C***  SET LEVEL OF MAINTENANCE FACTOR TO ONE
```

```
      NA=1
 3021 CONTINUE
C
C***  DETERMINE THE CREW HOUR COST FOR LABOR AND EQUIPMENT
      CU=PS(IA,ITYPE,1)
C
C   ***INITIALIZE WORKSITE TYPE
      M=SIM(IA,1)
C
C   ***DETERMINE IF WORKSITE IS UNIFORMLY OR RANDOMLY SPACED
      N=SIM(IA,5)
C
C   ***INITIALIZE LF, A LANE FACTOR USED TO MODIFY SIMULATION WORKLOAD
      LF=1
C
C***  ESTABLISH THE AMOUNT OF WORKLOAD TO BE DONE FOR EACH OCCUPANCY PERIOD
      WK=HWORK(IA)/NA
C
C***  ASSIGN CREW TRAVEL TIME TO TT
      TT=OVER(5,IA)
C
C***  DETERMINE THE OCCUPANCY FIXED CREW HOURS FOR EACH OCCUPANCY
      FIXHRS=2*OVER(8,IA)+OVER(7,IA)
C
C***  TEST CREW WORK HOURS AGAINST 24, WHICH MEANS CONTINUOUS WORK
      IF(OVER(1,IA).NE.24)GOTO 3050
C
C***  ASSUME NO CREW TRAVEL TIME OR FIXHOURS FOR 24 HR OCCUPANCY
      TT=0
      FIXHRS=0
C
C***  ADJUST AVAILABLE CREW HOURS FOR TRAVEL TIME
 3050 CREWT=OVER(1,IA)-TT
C
C***  ASSIGNMENT PROCESS FOR ALL POSSIBLE LANE CLOSURES
      DO 3031 IC=1,LANES
C
C   ***TEST TO DETERMINE IF LANE FACTOR,'LF' WILL BE SET EQUAL TO LANES CLOSED
      IF(M.EQ.3)LF=IC
C
C   ***INITIALIZE FIRST UNAVAILABLE HOUR OF ROADWAY OCCUPANCY TO ZERO
      IM1=0
C
C   ***ADJUST THE AVAILABLE OCCUPANCY HOURS ARRAY 'IHOUR' FOR V/C CONSTRAINS
      DO 3700 IH=1,24
C
C   ***INITIALIZE JHOUR TO IHOUR
      JHOUR(IH)=IHOUR(IH,IA)
 3700 CONTINUE
C
C   ***IF DETOUR EXISTS  BYPASS V/C RESTRAINTS
      IF(IC.EQ.LANES.AND.OVER(12,IA).EQ.0)GOTO 3703
C
C   ***TEST TO DETERMINE IF ROAD WILL BE CLOSED FOR 24 HOURS
```

```
      IF(OVER(1,IA).EQ.24)GOTO 3703
      DO 3704 IH=1,24
C
C   ***DETERMINE THE CAPACITY OF CLOSURE
      CAPACT=CAP(IC)+(OVER(12,IA)*CAP(LANES))
      IF(IC.NE.LANES)GOTO 3701
C
C   ***DETERMINE CAPACITY OF SHOULDERS
      CAPACT=CAP(IC)*OVER(12,IA)
 3701 CONTINUE
C
C   ***COMPUTE THE VOLUME CAPACITY RATIO
      TEMP1=HVOL(IH)/(CAPACT*(1-PCTADT(IH,6,ID,1)))
C
C   ***TEST THE VOLUME-CAPACITY RATIO AGAINST THE PERMITTED V/C RATIO
 3702 IF(TEMP1.GT.OVER(10,IA))JHOUR(IH)=0
 3704 CONTINUE
 3703 CONTINUE
C
C***   INITIALIZE THE NUMBER OF TRAFFIC CONTROL ZONES FOR LANE CLOSURE TO ZERO
      NZ=0
C
C***   INITIALIZE THE ACCUMULATED ZONE LENGTH FOR LANE CLOSURE TO ZERO
      ZL=0
C
C***   INITIALIZE CREW HOURS FOR LANE CLOSURE TO ZERO
      CREWH(IC)=0
C
C   ***INITIALIZE NO AVAILABLE OCCUPANCY TIME INDEX
      NOTIME(IC)=0
C
C***   INITIALIZE OCCUPANCY HOURS FOR LANE CLOSURE TO ZERO
      DO 3015 IH=1,24
      HRS(IA,IH,IC)=0
 3015 CONTINUE
C
C***   ESTABLISH SIMULATION WORKLOAD DENSITY FACTOR
      DENSEW=SWORK(IA)*LF/(WK*IC)
C
C
C***   SIMULATE THE ASSIGNMENT OF CREWS TO THE ROAD TO PERFORM WORK
C
C
C***   INITIALIZE VARIABLES FOR SIMULATION PROCESS
C***   PATCH ARRAY COUNTER
      IW=0
C
C***   ACCUMULATED PRODUCTION TIME
      TTIME=0
C
C   ***ESTABLISH THE NUMBER OF SIMULATION ITERATIONS
      ISIM=SIM(IA,4)
C
C   ***ESTABLISH SIMULATION FACTOR FOR RANDOM LOCATIONS
```

```
      SFACT=1000/ISIM
C
C***  INCREMENT THE WORKLOAD ARRAY
 3025 IW=IW+1
      IF(IW.GT.ISIM)GOTO 3030
C
C
C     SUBROUTINE AVAILH
C
C
C***  IF IM1 IS ZERO THIS IS THE FIRST TIME FOR ROUTINE,ACTIVITY,CLOSURE
      IF(IM1.NE.0)GOTO 3492
C
C***  DETERMINE THE FIRST HOUR WHEN CREWS CAN NOT OCCUPY ROAD
      DO 3490 I=1,24
      IF(JHOUR(I).EQ.0)GOTO 3491
 3490 CONTINUE
C
C***  ASSUME FIRST OCCUPANCY HOUR TO BE 6AM IF ALL HOURS ARE AVAILABLE
      IM1=6
      GOTO 3492
 3491 IM1=I
C
C***  INITIALIZE AVAILABLE CREW HOURS FOR A CONTINUOUS OCCUPANCY
 3492 AVAIL=0
C
C***  DETERMINE FIRST AVAILABLE OCCUPANCY HOUR
      DO 3500 I=IM1,24
      IF(JHOUR(I).EQ.1)GOTO 3501
 3500 CONTINUE
C
C***  ALLOW SEARCH TO CONTINUE INTO NEXT DAY
      DO 3504 I=1,24
      IF(JHOUR(I).EQ.1)GOTO 3501
 3504 CONTINUE
      NOTIME(IC)=1
      GOTO 3031
C
C***  ACCUMULATE IN AVAIL THE TOTAL HOURS OF CONTINUOUS OCCUPANCY
 3501 CONTINUE
C
C***  IM2 IS ASSIGNED TO 1ST AVAILABLE WORK HOUR
      IM2=I
C
      DO 3502 J=I,24
C
C  ***TEST FOR AN AVAILABLE HOUR
      IF(JHOUR(J).EQ.0)GOTO 3505
C
C  ***ACCUMULATE THE NUMBER OF CONTINUOUS AVAILABLE HOURS
 3502 AVAIL=AVAIL+1
C
C***  ALLOW THE ACCUMULATED HOURS OF OCCUPANCY TO CONTINUE INTO THE NEXT DAY
      DO 3503 J=1,24
```

```
      IF(JHOUR(J).EQ.0)GOTO 3505
C
C***  THE WORK PERIOD MAY NOT EXCEED 24 HOURS FOR A GIVEN LOOP
      IF(AVAIL+1.GT.24)GOTO 3505
 3503 AVAIL=AVAIL+1
C
C***  THE VALUE OF J ASSIGNED TO IM1 REFLECTS THE 1ST UNAVAILABLE HOUR OR 6AM
 3505 IM1=J
C
C  ***MAKE THE CONTINUOUS AVAILABLE OCCUPANCY TIME EQUAL TO
C  ***THE SMALLER VALUE BETWEEN NET CREW TIME 'CREWT' OR 'AVAIL'
      IF(CREWT.LT.AVAIL)AVAIL=CREWT
C
C  ***ADJUST AVAIL FOR THE FIXED HOURS REQUIRED ON THE ROADWAY
      AVAIL=AVAIL-FIXHRS
C
C***  ESTABLISH THE LOCATION OF THE FIRST WORKSITE IN THE TRAFFIC ZONE
      DIST1=DENSEW*RLOC(IW)
C
C  ***INITIALIZE THE SPACING FACTOR 'SF' FOR UNIFORM SPACING
      SF=DIST1
C
C***  DETERMINE THE AMOUNT OF TIME REQUIRED TO DO WORK AT FIRST SITE
      INDEX=1
      GOTO 3100
 3120 CONTINUE
C
C***  SUBTRACT WORKTIME FROM AVAILABLE WORK TIME
      AVAIL=AVAIL-TIME
C
C***  ACCUMULATE THE PRODUCTIVE WORK TIME ON THE ROAD
      TTIME=TTIME+TIME
C
C***  HOLD THE LOCATION OF THE WORK SITE WHICH HAS JUST BEEN COMPLETED
      DIST3=DIST1
C
C***  TEST TO DETERMINE IF AVAILABLE WORK TIME IS EXCEEDED
      IF(AVAIL)3200,3200,3110
C
C***  INCREMENT THE WORKLOAD ARRAY
 3110 IW=IW+1
C
C***  IF THE SIMULATION IS COMPLETE TOTAL CREW HRS. AND HOLD OCCUPANCY HRS.
      IF(IW.GT.ISIM)GOTO 3200
C
C***  DETERMINE THE LOCATION OF THE NEXT WORKSITE ON THE ROAD
C
C  ***GOTO APPROPRIATE SPACING FACTOR
      GOTO(3101,3102),N
C
C  ***RANDOM SPACING LOCATION
 3101 DIST2=DENSEW*RLOC(IW)*SFACT
      GOTO 3103
C
```

```
C  ***UNIFORM SPACING, BASED ON JOINT SPACING OR SPECIFIED SPACING FACTOR
C  ***SF IS ACCUMULATED DISTANCE FOR UNIFORM SPACING IN MILES
 3102 SF=SF+OVER(2,IA)/5280
C
C  ***UNIFORM SPACING LOCATION
      DIST2=SF
 3103 CONTINUE
C
C***  DETERMINE IF THE NEXT WORK SITE IS WITHIN THE ALLOWED TRAFFIC ZONE
C  ***AND IF IT IS THEN DETERMINE THE TIME REQUIRED TO DO WORK
      INDEX=3
      IF((DIST2-DIST1).LT.OVER(9,IA))GOTO 3100
C
C***  COMPUTE THE TIME REQUIRED TO MOVE AND INSTALL NEW TRAFFIC CONTROL ZONE
      TEMP1=(DIST2-DIST1)/TCMOVE+OVER(8,IA)
C
C  ***IF THE TRAVEL TIME TO THE NEXT SITE EXCEED 2 HRS, GET OFF ROAD
      IF(TEMP1.GT.(OVER(8,IA)+2))GOTO 3123
C
C***  DETERMINE TIME REQUIRED TO DO WORK AT FIRST SITE IN NEW T/C ZONE
      INDEX=2
      GOTO 3100
 3121 TIME=TIME+TEMP1
C
C  ***DETERMINE IF REMAINING AVAILABLE TIME WILL BE EXCEEDED
      IF((AVAIL-TIME).LT.0.)GOTO 3123
C
C  ***ACCUMULATE TRAFFIC CONTROL ZONE DISTANCE
      ZL=ZL+(DIST3-DIST1)
C
C  ***ACCUMULATE THE NUMBER OF TRAFFIC CONTROL ZONES
      NZ=NZ+1
C
C  ***INITIALIZE FIRST WORKSITE IN TRAFFIC CONTROL ZONE
      DIST1=DIST2
      GOTO 3111
C
C
C  ***COMPUTE THE TIME REQUIRED TO WALK TO NEXT WORKSITE
 3122 TIME1=(DIST2-DIST3)/WALK
C
C  ***IF THE TIME REQUIRED TO WALK TO THE NEXT SITE EXCEEDS 6 MINUTES, DRIVE
      IF(TIME1.GT..1)TIME1=TIME1*WALK/TCMOVE
C
C  ***COMPUTE TOTAL TIME TO DO NEXT WORK SITE
      TIME=TIME+TIME1
C
C  ***DETERMINE IF REMAINING AVAILABLE TIME WILL BE EXCEEDED
      IF((AVAIL-TIME).GE.0.0)GOTO 3111
C
C  ***RESET IW TO REFLECT THAT NEXT SITE WAS NOT DONE
 3123 IW=IW-1
      GOTO 3200
C
```

```
C***  ADJUST THE AVAILABLE TIME TO REFLECT PERFORMANCE OF WORK
 3111 AVAIL=AVAIL-TIME
C
C***  ADD TO ACCUMULATED PRODUCTION TIME
      TTIME=TTIME+TIME
C
C***  RESET THE LAST SITE WHERE WORK WAS COMPLETE
      DIST3=DIST2
      GOTO 3110
C
C   ***THIS ROUTINE DETERMINES PRODUCTION TIME AT WORKSITES
C
 3100 CONTINUE
C   ***BRANCH TO THE APPROPRIATE WORKSITE TYPE
      GOTO(3104,3105,3106),M
 3104 TEMP2=PATCHF(IW)
      GOTO 3107
 3105 TEMP2=PATCHP(IW)
      GOTO 3107
 3106 TEMP2=LF
C
C   ***COMPUTE PRODUCTION TIME AT A WORKSITE
 3107 IF(PS(IA,ITYPE,3).NE.0)GOTO 3109
      WRITE(MO,3108)IA
 3108 FORMAT(1H ,'ACTIVITY STANDARD',I2,' UNDEFINED')
 3109 TIME=(TEMP2*SIM(IA,2)+SIM(IA,3))/PS(IA,ITYPE,3)
C
C   ***RETURN TO APPROPRIATE PLACE IN SIMULATION
      GOTO(3120,3121,3122),INDEX
C
 3200 CONTINUE
C
C   ***ACCUMULATE TRAFFIC CONTROL ZONE DISTANCE
      ZL=ZL+(DIST3-DIST1)+OVER(11,IA)
C
C   ***ACCUMULATE THE NUMBER OF TRAFFIC CONTROL ZONES
      NZ=NZ+1
C
C***  TOTAL THE CREW HOURS ON THE ROAD
      STIME=TTIME+FIXHRS
C
C***  ACCUMULATE THE CREW HOURS FOR EACH ROADWAY OCCUPANCY
      CREWH(IC)=CREWH(IC)+STIME+TT
C
C***  DETERMINE LAST HOUR OF ROAD OCCUPANCY
      M1=IM2+STIME
C
C***  DETERMINE THE ACTUAL TIME SPENT IN LAST OCCUPANCY HOUR
      RTIME=IM2+STIME-M1
C
C***  DETERMINE LAST EVEN FULL OCCUPANCY HOUR
      M1=M1-1
C
C***  ASSIGN EACH HOUR OF ROADWAY OCCUPANCY TO AN ARRAY FOR EACH HOUR OF DAY
```

```
      DO 3201 K=IM2,M1
      J=K
C
C***  NO HOUR MAY EXCEED 24
      IF(J.GT.24)J=J-24
      HRS(IA,J,IC)=HRS(IA,J,IC)+1
 3201 CONTINUE
C
C***  GET THE LAST HOUR OF OCCUPANCY
      J=J+1
C
C***  NO HOUR MAY EXCEED 24
      IF(J.GT.24)J=J-24
C
C***  ASSIGN THE REMAINING OCCUPANCY TIME TO LAST OCCUPANCY HOUR
      HRS(IA,J,IC)=HRS(IA,J,IC)+RTIME
C
C***  INITIALIZE OCCUPANCY VARIABLES
      TTIME=0
      GOTO 3025
C
C***  END OF ROAD CLOSURE SIMULATION
C
C  ***DETERMINE THE AVERAGE TRAFFIC ZONE LENGTH FOR LANES CLOSED AND ACTIVITY
 3030 ZONEL(IA,IC)=ZL/NZ
C
C  ***FACTOR CREW AND OCCUPANCY HOURS FOR MULTIPLE LANE CLOSURES
      CREWH(IC)=CREWH(IC)/LF
      DO 3029 IH=1,24
      HRS(IA,IH,IC)=HRS(IA,IH,IC)/LF
 3029 CONTINUE
C
C  ***END OF LANE CLOSURE LOOP
 3031 CONTINUE
 3032 CONTINUE
C
C
C  ***ASSIGN DISTANCE BETWEEN DETOUR EXIST POINTS TO FREEWAY
C  ***INFLUENCE ZONE FOR ALL LANES CLOSED
      IF(OVER(12,IA).EQ.0)ZONEL(IA,LANES)=DETOUR(1)
C
C***  DETERMINE THE TOTAL MAINTENANCE COST FOR ACTIVITY AND EACH CLOSURE
C
C
C***  RATIO THE ANNUAL LANE MILE PROJECT WORKLOAD TO THE SIMULATION WORKLOAD
      W=HWORK(IA)*PROJLN/SWORK(IA)
C
C
C  ***DETERMINE CM, THE MATERIAL COSTS FOR THE OCCUPANCY WORKLOAD
      CM=HWORK(IA)*PROJLN*LANES*PS(IA,ITYPE,2)
C
C  ***INITIALIZE THE WORKLOAD TO ZERO NOW THAT WORK HAS BEEN COMPLETED
      IF(ID.EQ.2)HWORK(IA)=0
C
```

```
C***  GO TO THE APPROPRIATE EXPRESSWAY TYPE ROUTINE
      GOTO(3040,3051,3060),KP
C
C***  COMPUTE COST FOR THREE-FOUR LANE DIVIDED MAINTENANCE CLOSURES FOR YEAR
 3040.COSTS(IA,1,1,ID)=(CREWH(2)*2*W*CU)+CM
      COSTS(IA,2,1,ID)=(CREWH(1)*W*2*CU)+CM
      COSTS(IA,3,1,ID)=COSTS(IA,1,1,ID)
      IF(NOTIME(1).EQ.1)COSTS(IA,3,1,ID)=1000000000
      GOTO 3070
C
C***  COMPUTE COST FOR FOUR-SIX LANE DIVIDED MAINTENANCE CLOSURES FOR YEAR
 3051 COSTS(IA,1,1,ID)=(CREWH(3)*3*W*CU)+CM
      COSTS(IA,2,1,ID)=((CREWH(2)*2*W+CREWH(1)*W)*CU)+CM
      COSTS(IA,3,1,ID)=(CREWH(1)*W*3*CU)+CM
      COSTS(IA,4,1,ID)=COSTS(IA,1,1,ID)
      IF(NOTIME(2).EQ.1)COSTS(IA,4,1,ID)=1000000000
      GOTO 3070
C
C***  COMPUTE COST FOR FIVE-EIGHT LANE DIVIDED MAINTENANCE CLOSURES FOR YEAR
 3060 COSTS(IA,1,1,ID)=(CREWH(4)*4*W*CU)+CM
      COSTS(IA,2,1,ID)=((CREWH(3)*3*W+CREWH(1)*W)*CU)+CM
      COSTS(IA,3,1,ID)=(CREWH(2)*2*W*2*CU)+CM
      COSTS(IA,4,1,ID)=(CREWH(1)*W*4*CU)+CM
      COSTS(IA,5,1,ID)=COSTS(IA,1,1,ID)
      IF(NOTIME(2).EQ.1)COSTS(IA,5,1,ID)=1000000000
 3070 CONTINUE
      DO 3072 IC=1,LANES
      IF(NOTIME(IC).EQ.0)GOTO 3072
      J=LANES-IC+1
      COSTS(IA,J,1,ID)=1000000000
 3072 CONTINUE
      IF(NOTIME(LANES).EQ.1)COSTS(IA,LANES+1,1,ID)=1000000000
C
C***  CONVERT THE SIMULATION OCCUPANCY HOURS TO WORKLOAD OCCUPANCY HOURS
C***  FOR EACH LANE CLOSURE FOR THE YEAR
      DO 3080 IH=1,24
      DO 3081 IC=1,LANES
      HRS(IA,IH,IC)=HRS(IA,IH,IC)*W*IC
 3081 CONTINUE
 3080 CONTINUE
 3010 CONTINUE
      RETURN
      END
```

```
C
C*****************************************************************C
C*****************************************************************C
C*****************                              ***************C
C*****************      SUBROUTINE   MOTOR      ***************C
C*****************                              ***************C
C*****************      PROGRAM 'EAROMAR'       ***************C
C*****************************************************************C
C*****************************************************************C
C*****************************************************************C
C
      SUBROUTINE MOTOR
      INTEGER COSTS(7,5,8,2)
      COMMON            ARHO,           CAP(5),          COSTS,
     1 CWT,             DVOL(24),       HVOL(24),        ID,
     2 IHOUR(24,7),     ITYPE,          IY,              KP,
     3 LANES,           MI,             MO,              NYEARS,
     4 OCOSTS(65,2),    PATCHF(1000),   PATCHP(1000),    PROJLN,
     5 RLOC(1000),      SIM(7,5),       SP(5,11),        SPEEDD(24),
     6 SPEEDN(24),      SPLIT(2),       SWORK(7),        TRUCKS(2),
     7 VOLUME(2),       VTRATE(5,40),   ZONEL(7,4)
      COMMON/ASSUME/    ALIGN(3,6),     AACOST,          COMVOT,
     1 DETOUR(7),       DLIFE,          FUEL(2),         HRS(7,24,4),
     2 HWORK(7),        IDIR,           INC,             IPRINT,
     3 IWT,             JPRINT,         OCSCHL,          OCWORK,
     4 OIL(2),          OVER(12,7),     PCTADT(24,7,2,2),PS(7,3,3),
     5 PSIRS,           RATEI,          RLIFE,           SINDEX,
     6 SLIMIT(5),       TCMOVE,         TIRES(2),        TLEVEL(7),
     7 WALK,            WIDTH,          WEIGHT(10,3)
      DIMENSION ACDTS(4)
      DIMENSION ACD(7,3)
      DIMENSION AVOL(24)
      DIMENSION CROSS(4)
      DIMENSION POLUTE(4)
      DIMENSION QUECST(2)
      DIMENSION SPEED(24),DELAY(24)
C
C   ***ACCIDENT EQUATIONS INTERCEPTS AND COEFFICIENTS
      DATA ACD/-4.39,-5.75,-7.26,-6.14,-4.54,-7.32,.96,
     2.51,.76,.77,.68,.59,.67,.99,
     3.69,.81,.95,.85,.73,1.06,.95/
      SCZONE=1.0
      PWT=WEIGHT(1,1)
      INDEX=0
C
C
C   ***MOTOREST LEVEL,DETERMINATION OF THE MOTOREST IMPACT PERIOD
C
C
C
C   ***DETERMINE THE APPLICABLE DAYS FOR EACH LANE CLOSURE DURATION BY
C   ***ACTIVITY BY CLOSURE TYPE
C
C
```

```
      DO 5000 IA=1,7
      IF(OVER(6,IA).EQ.0)GOTO 5000
C
C
C   ***INITIALIZE THE FACTOR FOR SIGNALS ON DETOUR
      CYCLE=0
C
C   ***INITIALIZE THE DETOUR TRAFFIC VOLUME FACTOR
      DFACT=1
C
      DO 5100 IC=1,LANES
C
C
C   ***INITIALIZE ACCIDENTS
      ACDTS(IC)=0
C   ***INITIALIZE POLUTE
      POLUTE(IC)=0
C
C
C   ***INITIALIZE THE CROSS OVER FACTOR 'CROSS'
      CROSS(IC)=0
C
C   ***ACCUMULATE THE TOTAL HOURS OF ROADWAY OCCUPANCY FOR EACH LANE CLOSURE
      DO 5080 IH=1,24
 5080 CROSS(IC)=CROSS(IC)+HRS(IA,IH,IC)
C
C   ***INITIALIZE THE CAPACITY TO 'CAP' PLUS SHOULDERS IF AVAILABLE
      CAPACT=CAP(IC)+CAP(LANES)*OVER(12,IA)
C
C   ***IF ALL LANES ARE CLOSED A DETOUR SITUTAION CAN EXIST
      IF(IC.NE.LANES)GOTO 5201
C
C   ***TEST FOR DETOUR
      IF(OVER(12,IA).GT.0)GOTO 5090
C
C   ***COMPUTE THE DETOUR VOLUME FACTOR
      DFACT=(VOLUME(1)+DETOUR(4))/VOLUME(1)
C
C   ***ESTABLISH AVERAGE DETOUR STOPS
      CYCLE=DETOUR(6)
C
C   ***CAPACITY OF DETOUR
      CAPACT=DETOUR(5)
      GOTO 5201
C
C   ***DETERMINE CAPACITY OF SHOULDERS FOR ALL LANES CLOSED
 5090 CAPACT=CAP(LANES)*OVER(12,IA)
C
C   ***INITIALIZE STARTING HOUR
 5201 IBEGIN=1
 5001 CONTINUE
C
C   ***DETERMINE THE FIRST HOUR OF TRAFFIC IMPACT
      DO 5500 IH=IBEGIN,24
```

```
      IF(HRS(IA,IH,IC).NE.0)GOTO 5501
 5500 CONTINUE
C
C  ***GET ANOTHER CLOSURE
      GOTO 5100
C
C  ***SET INITIAL IMPACT HOUR
 5501 IBEGIN=IH
C
C  ***DETERMINE IMPACT DURATION
      DO 5510 IH=IBEGIN,23
      TEMP1=HRS(IA,IH,IC)
      TEMP2=HRS(IA,IH+1,IC)
C
C  ***DETERMINE IF THERE IS CHANGE IN OCCUPANCY DURATION
      IF(TEMP1.EQ.TEMP2)GOTO 5510
C
C  ***SET THE DAYS OF IMPACT EQUAL TO THE DIFFERENCE IN OCCUPANCY DURATION
      DAYS=TEMP1-TEMP2
C
C  ***OCCUPANCY DURATION MUST BE POSITIVE
      IF(DAYS.LT.0)DAYS=TEMP1
C
C  ***SET THE LAST HOUR OF OCCUPANCY
      IEND=IH
      GOTO 5511
 5510 CONTINUE
C
C  ***SET THE DAYS OF IMPACT FOR FINAL HOUR
      DAYS=TEMP2
      IF(DAYS.EQ.0)GOTO 5001
C
C  ***SET THE END OF OCCUPANCY AT FINAL HOUR
      IEND=24
C
C  ***INITIALIZE THE QUEUE AND THE FIRST DELAY TIME TO ZERO
 5511 QUEUE=0
      TIME1=0
C
C
C  ***DETERMINE THE CLOSURE CATEGORY  SUBSCRIPT
      J=IC
C
C  ***WHEN ALL LANES ARE CLOSED AND SHOULDERS ARE AVAILABLE
C  ***USE THE SPEED CURVE DETERMINED FOR ONE LANE OPEN TO MOTOREST
      IF(IC.EQ.LANES.AND.OVER(12,IA).GT.0)J=LANES-1
      FACT1=1
C
C  ***DETERMINE THE VOLUME,DELAY AND SPEED FOR EACH HOUR OF IMPACT
      DO 5520 IH=IBEGIN,IEND
C
C  ***DECREASE THE OCCUPANCY ARRAY BY THE DAYS USED DURING THE IMPACT PERIOD
      HRS(IA,IH,IC)=HRS(IA,IH,IC)-DAYS
C
```

```
C  ***MODIFY THE CAPACITY FOR COMMERCIAL TRAFFIC VOLUME
 5521 FCAP=(1-PCTADT(IH,6,ID,1))*CAPACT
C
C  ***DETERMINE THE VOLUME WHICH MUST BE HANDLED DURING THE HOUR
      AVOL(IH)=HVOL(IH)*DFACT+QUEUE
C
C  ***ESTABLISH THE VOLUME WHICH WILL BE HANDLED DURING THE HOUR
      IF(AVOL(IH).GT.FCAP)AVOL(IH)=FCAP
C
C  ***HOLD ANY EXCESS VOLUME IN A QUEUE
      QUEUE=HVOL(IH)*DFACT-FCAP+QUEUE
C
C  ***THE QUEUE CANNOT BE LESS THAN ZERO
      IF(QUEUE.LT.0)QUEUE=0
C
C  ***DETERMINE THE DELAY TO THE LAST VEHICLE WHICH WILL PASS DURING THE HOUR
      TIME2=QUEUE/(HVOL(IH)*DFACT)
C
C  ***ESTABLISH AN AVERAGE DELAY FOR ALL VEHICLES WHICH WILL PASS IN THE HOUR
      DELAY(IH)=(TIME1+TIME2)/2*FACT1
C
C  ***RESET THE DELAY TO BE ASSOCIATED WITH FIRST VEHICLE IN HOUR
      TIME1=TIME2
C
C  ***COMPUTE VOLUME-CAPACITY RATIO
      VC=AVOL(IH)/FCAP
C
C  ***DETERMINE SPEED MATRIC SUBSCRIPT
      I=(VC+.15)*10.
C
C  ***DETERMINE THE SPEED OF VEHICLES PASSING THROUGH THE TRAFFIC CONTROL ZONE
      SPEED(IH)=SP(J,I)
 5520 CONTINUE
      IF(QUEUE.EQ.0)GOTO 5530
      IF(IH.EQ.24)GOTO 5530
C
C  ***INCREMENT THE HOURS BEYOND THE OCCUPANCY PERIOD TO ACCOMODATE ANY QUEUE
      IH=IH+1
C
C  ***RESET THE CAPACITY TO NORMAL
      CAPACT=CAP(LANES+1)
      IF(QUEUE+HVOL(IH).LT.CAPACT)FACT1=QUEUE/CAPACT
C
C  ***SET J EQUAL NORMAL SPEED CURVE
      J=LANES+1
C
C  ***INCREMENT THE IMPACT PERIOD
      IEND=IEND+1
      GOTO 5521
 5530 CONTINUE
C
C
C     SUBROUTINE VOCOST
C
```

```
C
C   ***ACCUMULATE OPERATION COSTS FOR THE IMPACT PERIOD
       ZONE=ZONEL(IA,IC)
       DO 6000 IH=IBEGIN,IEND
C
C   ***INITIALIZE TEMPORARY VARIABLE TEMP3 TO ZERO AND POSITION INDEX TO ZERO
       INDEX=0
C
C   ***ROUND NORMAL SPEED TO INTEGER VALUE
       I=SPEEDN(IH)+.5
C
C   ***DETERMINE POLUTION FACTOR FOR FREEWAY SPEED NORMAL
       P=SPEEDN(IH)
       PV=.89*(EXP(1.193-.032*P)+.11*(EXP(0.957-.026*P)))
C
C   ***DETERMINE NORMAL PASSENGER CAR OPERATION COSTS FOR THE HOUR
       TEMP1=OCOSTS(I,1)*HVOL(IH)*(1-PCTADT(IH,6,ID,1))
C
C   ***DETERMINE NORMAL COMMERCIAL VEHICLE COSTS FOR THE HOUR
       TEMP2=OCOSTS(I,2)*HVOL(IH)*PCTADT(IH,6,ID,1)
C
C   ***HOLD NORMAL OPERATION COST FOR HOUR
       QUECST(1)=TEMP1+TEMP2
C
C   ***TEST TO DETERMINE IF DETOUR CLOSURE IS BEING PROCESSED
       IF(IC.NE.LANES)GOTO 6002
C
       IF(OVER(12,IA).NE.0)GOTO 6002
C
C   ***ROUND DETOUR SPEED TO INTEGER VALUE
       I1=SPEEDD(IH)+.5
C
C   ***DETERMINE POLUTION FACTOR FOR  DETOUR NORMAL
       P=SPEEDD(IH)
       PD=.89*(EXP(1.193-.032*P)+.11*(EXP(0.957-.026*P)))
C
C   ***DETERMINE NORMAL PASSENGER CAR OPERATION COSTS IN DETOUR FOR THE HOUR
       TEMP3=OCOSTS(I1,1)*DVOL(IH)*(1-PCTADT(IH,6,ID,1))
C
C   ***DETERMINE NORMAL COMMERCIAL VEHICLE COSTS IN DETOUR FOR THE HOUR
       TEMP4=OCOSTS(I1,2)*DVOL(IH)*PCTADT(IH,6,ID,1)
C
C   ***COMBINE VEHICLES AND DETERMINE THEIR COSTS THROUGH DETOUR
       TEMP3=(TEMP3+TEMP4)*DETOUR(2)/SPEEDD(IH)
       TEMP1=(TEMP1+TEMP2)*DETOUR(1)/SPEEDN(IH)+TEMP3
       TEMP1=(TEMP1+TEMP2)*ZONEL(IA,IC)/SPEEDN(IH)+TEMP3
       ZONE=DETOUR(2)
       GOTO 6003
C
C   ***COMBINE VEHICLES AND DETERMINE THEIR COSTS THROUGH TRAFFIC CONTROL ZONE
 6002  TEMP1=(TEMP1+TEMP2)*ZONEL(IA,IC)/SPEEDN(IH)
C
C   ***ROUND SPEED THROUGH TRAFFIC CONTROL ZONE TO INTEGER VALUE
 6003  J=SPEED(IH)+.5
```

```
C
C  ***DETERMINE POLUTION FACTOR FOR  INFLUENCE ZONE
      P=SPEED(IH)
      PR=.89*(EXP(1.193-.032*P)+.11*(EXP(0.957-.026*P)))
C
C  ***HOURLY PASSENGER CAR OPERATION COSTS THROUGH THE TRAFFIC CONTROL ZONE
      TEMP2=OCOSTS(J,1)*AVOL(IH)*(1-PCTADT(IH,6,ID,1))
C
C  ***HOURLY COMMERCIAL VEHICLE OPERATION COSTS THROUGH THE TRAFFIC CONTROL ZONE
      TEMP3=OCOSTS(J,2)*AVOL(IH)*PCTADT(IH,6,ID,1)
C
C  ***COMBINE VEHICLES AND DETERMINE THEIR COSTS THROUGH TRAFFIC CONTROL ZONE
      TEMP2=(TEMP2+TEMP3)*ZONE/SPEED(IH)
C
C  ***DETERMINE SPEED CHANGE - DIFFERENCE BETWEEN NORMAL AND SPEED THROUGH ZONE
      K=1.5*(I-J)
      IF(K.LE.1)K=1
      IF(K.GT.I)K=I
C
C  ***SET THE SPEED CHANGE EQUAL TO INITIAL SPEED IF A QUEUE EXIST
      IF(DELAY(IH).NE.0)K=I
      S=K
C
C  ***FACT1 IS THE TOTAL PASSENGER CARS DURING THE HOUR
      FACT1=AVOL(IH)*(1-PCTADT(IH,6,ID,1))*1000
C
C  ***FACT2 IS THE TOTAL COMMERCIAL VEHICLES DURING THE HOUR
      FACT2=AVOL(IH)*PCTADT(IH,6,ID,1)*1000
C
C  ***FUEL CONSUMPTION SPEED CHANGE MODELS
 6005 CONTINUE
      A=-8+.0035*I
      B=.91+.00134*I
      TEMP3=EXP(A+B*ALOG(S))
      RW=CWT**1.2/5.277
      TEMP4=TEMP3*RW
      TEMP3=TEMP3*FACT1*FUEL(1)
      TEMP4=TEMP4*FACT2*FUEL(2)
C
C  ***COMBINE PASSENGER CAR AND COMMERCIAL VEHICLE COSTS-FUEL
       TEMP3=TEMP3+TEMP4
C
C  ***TIRE WEAR SPEED CHANGE MODELS
      RW=-.64+.16*CWT
      A=EXP(-4.85+.046*I)
      B=EXP(-4.7+.0417*I)
      TEMP4=(-A+B*ALOG(S))
      IF(TEMP4.LT.0.)TEMP4=0
      TEMP5=RW*TEMP4
      RW=-.64+.16*PWT
      TEMP4=TEMP4*FACT1*TIRES(1)*RW
      TEMP5=TEMP5*FACT2*TIRES(2)
C
C  ***COMBINE PASSENGER CAR AND COMMERCIAL VEHICLE COSTS-TIRES
```

```
      TEMP4=TEMP4+TEMP5
C
C   ***OIL CONSUMPTION SPEED CHANGE MODELS
      RW=EXP(-1.347+.954*ALOG(CWT))
      A=-20.5+.09*I
      B=1.8
      TEMP5=EXP(A+B*ALOG(S))
      TEMP6=TEMP5*RW
      RW=EXP(-1.347+.954*ALOG(PWT))
      TEMP5=TEMP5*FACT1*OIL(1)*RW
      TEMP6=TEMP6*FACT2*OIL(2)
C
C   ***COMBINE PASSENGER CAR AND COMMERCIAL VEHICLE COSTS-OIL
      TEMP5=TEMP5+TEMP6
C
C   ***OPERATION MAINTENANCE COST SPEED CHANGE MODELS
      A=-.298+.00605*I
      B=.3642-.00173*I
      C=.00506-.000025*I
      RW=A+B*CWT-C*CWT**2
      FACT3=A+B*PWT-C*PWT**2
      SS=I
      A=2.56+1.3*ALOG(SS)
      B=1.3+.0068*I
      TEMP6=EXP(-A+B*ALOG(S))/1000
      TEMP7=TEMP6*RW
      TEMP6=TEMP6*FACT1*FACT3
      TEMP7=TEMP7*FACT2
C
C   ***COMBINE PASSENGER CAR AND COMMERCIAL VEHICLE COSTS-MAINTENANCE
      TEMP6=(TEMP6+TEMP7)*SINDEX
C
C   ***PLACE THE SPEED CHANGE COST FOR FUEL,TIRES,OIL AND MAINTENANCE IN TEMP3
      TEMP3=TEMP3+TEMP4+TEMP5+TEMP6
C   ***HOLD THE SPEED CHANGE COSTS FOR USE IF A QUEUE IS LEFT OVER
      IF(INDEX.EQ.0)Q1=TEMP3/AVOL(IH)
C
C   ***TEST TO DETERMINE IF DETOUR HAS TRAFFIC SIGNALS
      IF(CYCLE.EQ.0)GOTO 6010
C
C   ***SET THE INDEX FOR THE SEQUENCING PROCEDURE
      INDEX=INDEX+1
C
C   ***BRANCH TO APPROPRIATE SPEED CHANGE ROUTINE
      GOTO(6006,6007),INDEX
      GOTO 6010
C
C   ***ACCUMULATE SPEED CHANGE COST DETERMINE FOR FREEWAY TO DETOUR
 6006 COSTS(IA,IC,2,ID)=COSTS(IA,IC,2,ID)+TEMP3*DAYS
C
C   ***SET SPEED CHANGE AND INITIAL SPEED FOR NORMAL OPERATION ON DETOUR
      S=SPEEDD(IH)
      I=SPEEDD(IH)
      GOTO 6005
```

```
C
C   ***ACCUMULATE THE SPEED CHANGE COSTS NORMALLY INCURRED ON DETOUR ROUTE
 6007 COSTS(IA,IC,2,ID)=COSTS(IA,IC,2,ID)-TEMP3*DAYS*DVOL(IH)/AVOL(IH)
C
C   ***SET SPEED CHANGE AND INITIAL SPEED FOR DETOUR OPERATION ON DETOUR
      S=SPEED(IH)
      I=SPEED(IH)
      GOTO 6005
 6010 CONTINUE
C
C   ***DETERMINE AVERAGE OPERATING SPEED IN QUEUE
      K=(SPEED(IH)+.5)/2.
C
C   ***DETERMINE PASSENGER CAR DELAY COST FOR THE HOUR
      TEMP4=FACT1*OCOSTS(K,1)/1000
C
C   ***DETERMINE COMMERCIAL VEHICLE DELAY COSTS FOR THE HOUR
      TEMP5=FACT2*OCOSTS(K,2)/1000
C
C   ***COMBINE PASSENGER CAR AND COMMERCIAL VEHICLE DELAY COSTS
      QUECST(2)=TEMP4+TEMP5
C   ***DETERMINE THE LENGTH OF THE QUEUE
      DIST=DELAY(IH)*SPEED(IH)/2
C
C
C   ***DETERMINE NORMAL COSTS IN QUEUE ZONE
      QUECST(1)=QUECST(1)*DIST/SPEEDN(IH)
C
C   ***DETERMINE OPERATION COSTS FOR VEHICLES WHILE IN QUEUE
      QUECST(2)=QUECST(2)*DELAY(IH)
C
C   ***DETERMINE NET OPERATION COSTS IN QUEUE
      TEMP4=QUECST(2)-QUECST(1)
C
C   ***DETERMINE POLUTION FACTOR FOR QUEUE
      P=SPEED(IH)/2
      PQ=.89*(EXP(1.193-.032*P)+.11*(EXP(0.957-.026*P)))
C
C   ***COMPUTE THE TOTAL OPERATION COST FOR THE HOUR
      TEMP1=(TEMP2+TEMP3+TEMP4-TEMP1)*DAYS
C
C   ***ACCUMULATE OPERATION COSTS
      COSTS(IA,IC,2,ID)=COSTS(IA,IC,2,ID)+TEMP1
C
C
C     SUBROUTINE POLUTE
C
C
C   ***TEST TO DETERMINE IF ALL LANES ARE CLOSED
      IF(IC.NE.LANES)GOTO 6020
C
C   ***TEST TO DETERMINE IF ANY SHOULDERS ARE AVAILABLE
      IF(OVER(12,IA).GT.0)GOTO 6020
C
```

```
C   ***DETERMINE DAYS OF POLUTION FOR DETOUR CONDITION
C
C   ***DETERMINE PERCENTAGE SPLIT BETWEEN FREEWAY AND DETOUR NORMAL
       FACT1=HVOL(IH)/(HVOL(IH)+DVOL(IH))
C
C   ***DETERMINE FREEWAY DETOUR EQUIVALENT VEHICLE MILES
       TEMP1=(PR/PV-1)*AVOL(IH)*FACT1*DETOUR(1)
C
C   ***DETERMINE EXTRA VEHILCE MILES ADDED BY DETOUR
       TEMP2=(PR/PV)*AVOL(IH)*FACT1*(DETOUR(2)-DETOUR(1))
C
C   **DETERMINE FREEWAY EQUIVALENT NORMAL DETOUR VEHICLE MILES
       TEMP3=(PR/PD-1)*AVOL(IH)*(1-FACT1)*DETOUR(2)
       TEMP3=PV/PD*TEMP3
C
C   ***TOTAL THE VEHICLE MILES
       TEMP1=TEMP1+TEMP2+TEMP3
       GOTO 6030
C
C   ***NON DETOUR SITUATION
 6020 CONTINUE
C
C   ***DETERMINE EQUIVALENT NORMAL FREEWAY VEHICLE MILES
       TEMP1=(PR/PV-1)*AVOL(IH)*ZONE
 6030 CONTINUE
C
C   ***DETERMINE NORMAL FREEWAY EQUIVALENT VEHICLE MILES FOR QUEUE
       TEMP2=(PQ/PV-1)*AVOL(IH)*DIST
C
C   ***TOTAL THE VEHICLE MILES
       TEMP1=TEMP1+TEMP2
C
C   ***ACCUMULATE VEHICLE MILES OF POLUTION
       POLUTE(IC)=POLUTE(IC)+TEMP1*DAYS
 6000 CONTINUE
       IF(QUEUE.EQ.0)GOTO 6040
C
C   ***ADJUST POLUTION DAYS TO INCLUDE VEHICLES LEFT IN THE QUEUE
       POLUTE(IC)=POLUTE(IC)+(PQ/PV-1)*QUEUE*DIST
C
C   ***MAKE ADJUSTMENT IN OPERATION COSTS FOR ANY VEHICLE LEFT IN QUEUE
C
C   ***GET THE NORMAL SPEED OF VEHICLES ON THE FREEWAY
       I=SPEEDN(24)+.5
C
C   ***COMPUTE THE NORMAL TIME FOR PASSING THRU THE CLOSURE ZONE
       C=ZONEL(IA,IC)/SPEEDN(24)
C
C   ***COMPUTE THE PASS. CAR OPERATING COSTS FOR PASSING THRU THE ZONE
       TEMP1=QUEUE*OCOSTS(I,1)*(1-PCTADT(24,6,ID,1))*C
C
C   ***COMPUTE THE COM. VEHICLE OPERATING COSTS FOR PASSING THRU THE ZONE
       TEMP2=QUEUE*OCOSTS(I,2)*PCTADT(24,6,ID,1)*C
C
```

```
C   ***COMBINE OPERATING COSTS, COMPUTE SPEED CHANGE COSTS, AND EXPAND BY DAYS
      TEMP1=(TEMP1+TEMP2+QUEUE*Q1)*DAYS
C
C   ***COMPUTE THE AVERAGE SPEED OF A VEHICLE LEFT IN THE QUEUE
      K=SP(LANES+1,11)/2+.5
C
C   ***COMPUTE PASSENGER CAR OPERATING COSTS IN THE QUEUE
      TEMP3=QUEUE*OCOSTS(K,1)*(1-PCTADT(24,6,ID,1))
C
C   ***COMPUTE THE COMMERCIAL VEHICLE OPERATING COSTS IN THE QUEUE
      TEMP4=QUEUE*OCOSTS(K,2)*PCTADT(24,6,ID,1)
C
C   ***COMBINE COMMERCIAL&PASSENGER CAR QUEUE COSTS AND EXPAND BY DELAY AND DAYS
      TEMP3=(TEMP3+TEMP4)*DELAY(24)*DAYS
C
C   ***ADJUST OPERATING COSTS FOR VEHICLES LEFT IN THE QUEUE
      COSTS(IA,IC,2,ID)=COSTS(IA,IC,2,ID)+TEMP1+TEMP3
 6040 CONTINUE
C
C
C     SUBROUTINE TIME
C
C
C   ***INITIALIZE DETOUR PARAMETERS TO ZERO
      FACT2=0
      TEMP2=0
      TIMELD=0
      DO 6100 IH=IBEGIN,IEND
C
C   ***THE WEIGHTED VALUE OF COMMERCIAL TIME IS TEMP1
      TEMP1=COMVOT*PCTADT(IH,6,ID,1)
C
C   ***COMPUTE AVERAGE SPEED IN SPEED CHANGE ZONE
      TEMP3=.25*SPEEDN(IH)+.75*SPEED(IH)
C
C   ***COMPUTE TIME LOST IN SPEED CHANGE ZONE
      TEMP3=(SCZONE/TEMP3-SCZONE/SPEEDN(IH))*2
C
C   ***IF A QUEUE EXISTS COMPUTE TIME LOST IN SPEED CHANGES
      IF(DELAY(IH).NE.0)TEMP3=1.67*SCZONE/SPEEDN(IH)
C
C   ***BYPASS THE COMPUTATION OF LOSS TIME FOR DETOUR UNLESS ALL LANES ARE CLOSED
C   ***AND THE SHOULDERS ARE NOT AVAILABLE TO TRAFFIC
      IF(IC.NE.LANES)GOTO 6110
      IF(OVER(12,IA).GT.0)GOTO 6110
C
C   ***TIMEL IS THE TIME LOST BY A MOTORIST WHO NORMALLY TRAVELS THE FREWAY AND
C   ***IS FORCED TO TRAVEL THE DETOUR ROUTE
      TIMEL=DETOUR(2)/SPEED(IH)-DETOUR(1)/SPEEDN(IH)+DELAY(IH)+TEMP3
C
C   ***COMPUTE AVERAGE SPEED IN SPEED CHANGE ZONE
      TEMP4=.25*SPEEDD(IH)+.75*SPEED(IH)
C
C   ***COMPUTE TIME LOST IN SPEED CHANGE ZONE
```

```
      TEMP4=(SCZONE/TEMP4-SCZONE/SPEEDD(IH))*2
C
C   ***IF A QUEUE EXISTS COMPUTE TIME LOST IN SPEED CHANGES
      IF(DELAY(IH).NE.0)TEMP4=1.67*SCZONE/SPEEDD(IH)
C
C   ***TIMELD IS THE TIME LOST BY A MOTORIST WHO NORMALLY TRAVELS THE DETOUR
      TIMELD=DETOUR(2)/SPEED(IH)-DETOUR(2)/SPEEDD(IH)+DELAY(IH)+TEMP4
C
C   ***FACT1 IS THE RATIO OF THE NORMAL FREEWAY VOLUME TO THE TOTAL VOLUME ON THE
C   ***DETOUR ROUTE
      FACT1=HVOL(IH)/(HVOL(IH)+DVOL(IH))
C
C   ***FACT2 IS THE RATIO OF THE NORMAL VOLUME ON THE DETOUR ROUTE TO THE TOTAL
C   ***VOLUME ON THE DETOUR ROUTE
      FACT2=DVOL(IH)/(HVOL(IH)+DVOL(IH))
C
C   ***J IS THE TIMELOSS ON THE DETOUR ROUTE IN MINUTES TO THE NEAREST MINUTE
      J=ABS(TIMELD)*60+.5
      IF(J.EQ.0)GOTO 6102
      IF(J.GT.40)J=40
C
C   ***ACCUMULATE THE WEIGHTED VALUES OF TIME LOSS FOR ALL TRIP PURPOSES
      TEMP2=TEMP1
      DO 6101 IT=1,5
      TEMP2=TEMP2+VTRATE(IT,J)*PCTADT(IH,IT,ID,1)
 6101 CONTINUE
C
C   ***COMPUTE THE VALUE OF TIME LOST TO DETOUR ROUTE MOTORISTS
      TEMP2=TEMP2*TIMELD
      GOTO 6120
 6102 CONTINUE
      TEMP2=0
      GOTO 6120
C
C   ***COMPUTE THE TIME LOSS ON THE FREEWAY FOR A NONDETOUR SITUATION
 6110 TIMEL=ZONEL(IA,IC)/SPEED(IH)-ZONEL(IA,IC)/SPEEDN(IH)+DELAY(IH)
      TIMEL=TIMEL+TEMP3
C
C   ***SET THE RATIO OF THE FREEWAY NORMAL VOLUME TO THE TOTAL VOLUME EQUAL TO 1
      FACT1=1
C
C   ***I IS THE TIME LOST TO A FREEWAY MOTORIST IN MINUTES TO THE NEAREST MINUTE
 6120 CONTINUE
      I=ABS(TIMEL)*60+.5
      IF(I.EQ.0)GOTO 6100
      IF(I.GT.40)I=40
C
C   ***ACCUMULATE THE WEIGHTED VALUES OF TIME LOST
      DO 6121 IT=1,5
      TEMP1=TEMP1+VTRATE(IT,I)*PCTADT(IH,IT,ID,1)
 6121 CONTINUE
C
C   ***COMPUTE THE VALUE OF TIME LOST TO FREEWAY MOTORISTS
      TEMP1=TEMP1*TIMEL
```

```
C
C  ***COMPUTE THE AMOUNT OF TIME LOST BY ALL MOTORISTS IN HOURS
      COSTS(IA,IC,6,ID)=COSTS(IA,IC,6,ID)+AVOL(IH)*DAYS*1000*
     X(TIMEL*FACT1+TIMELD*FACT2)
C
C
C  ***COMPUTE THE VALUE OF TIME LOST FOR ALL MOTORISTS
      COSTS(IA,IC,5,ID)=COSTS(IA,IC,5,ID)+AVOL(IH)*DAYS*1000*
     X(TEMP1*FACT1+TEMP2*FACT2)
 6100 CONTINUE
      IF(QUEUE.EQ.0)GOTO 6140
C
C  ***MAKE ADJUSTMENT TO TIME LOSS AND TIME COST FOR VEHICLES LEFT IN QUEUE
      TEMP2=COMVOT*PCTADT(24,6,ID,1)
      TEMP1=QUEUE/CAP(LANES+1)*.5
      I=TEMP1*60+.5
      IF(I.EQ.0)I=1
      IF(I.GT.40)I=40
      DO 6130 IT=1,5
      TEMP2=TEMP2+VTRATE(IT,I)*PCTADT(24,IT,ID,1)
 6130 CONTINUE
      COSTS(IA,IC,5,ID)=COSTS(IA,IC,5,ID)+TEMP2*TEMP1*QUEUE*1000*DAYS
      COSTS(IA,IC,6,ID)=COSTS(IA,IC,6,ID)+TEMP1*QUEUE*1000*DAYS
 6140 CONTINUE
C
C
C     SUBROUTINE ACCID
C
C
C ***INITIALIZE NORMAL ACCIDENTS ON THE DETOUR TO ZERO
      TEMP3=0
C
C  *** SET TEMP6 EQUAL TO THE AVERAGE ZONE LENGTH
      TEMP6=ZONEL(IA,IC)
C
C  ***IF THE TRAFFIC IS DETOURED THE ZONE LENGTH IS THE DISTANCE
C  ***BETWEEN INTERCHANGES
      IF(IC.EQ.LANES.AND.OVER(12,IA).EQ.0)TEMP6=DETOUR(1)
C
C  ***COMPUTE  THE NORMAL ANNUAL ACCIDENTS ON THE FREEWAY
      TEMP1=ACD(LANES,1)+ACD(LANES,2)*ALOG(TEMP6)+ACD(LANES,3)
     X*ALOG(VOLUME(1)*2000*ABS(ID-1-SPLIT(1)/100))
C
C  ***TEST FOR DETOUR
      IF(IC.EQ.LANES.AND.OVER(12,IA).EQ.0)GOTO 6210
C
C  ***GET SUBSCRIPT FOR ACCIDENT EQUATION COEFICIENTS
      I=LANES-IC
C
C  ***SET FACTOR FOR MORE THAN ONE SHOULDER TO 1
      FACT3=1
C
C  ***IF  ALL LANES ARE CLOSED SET SHOULDER FACTOR EQUAL TO NUMBER OF SHOULDERS
      IF(I.EQ.0)FACT3=OVER(12,IA)
```

```
C
C   ***IF ALL LANES ARE CLOSED SET ACCIDENTS EQUATION COEFICIENTS SUBSCRIPT TO 1
      IF(I.EQ.0)I=1
C
C   ***COMPUTE THE ANNUAL ACCIDENTS FOR THE CLOSURE SITUATION
      TEMP2=ACD(I,1)+ACD(I,2)*ALOG(ZONEL(IA,IC))+ACD(I,3)
     X*ALOG((VOLUME(1)*2000*ABS(ID-1-SPLIT(1)/100))/FACT3)
C   *** SKIP THE COMPUTATION OF ACCIDENTS ON THE DETOUR
      GOTO 6220
C
C   *** SET THE SUBSCRIPT FOR THE ACCIDENTS EQUATION COEFFICIENTS FOR THE DETOUR
 6210 I=4+DETOUR(7)
      IF(I.GT.7)I=7
C
C   ***COMPUTE THE ANNUAL ACCIDENTS FOR THE DETOUR ROUTE WITH FREEWAY TRAFFIC
      TEMP2=ACD(I,1)+ACD(I,2)*ALOG(DETOUR(2))+ACD(I,3)
     X*ALOG((DETOUR(4)+VOLUME(1))*2000*ABS(ID-1-SPLIT(1)/100))
C
C   ***COMPUTE THE NORMAL ANNUAL ACCIDENTS FOR THE DETOUR
      TEMP3=ACD(I,1)+ACD(I,2)*ALOG(DETOUR(2))+ACD(I,3)
     X*ALOG(DETOUR(4)*1000*ABS(ID-1-SPLIT(1)/100))
      TEMP3=EXP(TEMP3)/2
C
C   ***COMPUTE THE ANNUAL INCREASE IN ACCIDENTS CAUSED BY THE CLOSURE
 6220 TEMP1=EXP(TEMP2)/2-EXP(TEMP1)/2-TEMP3
C
C   ***INCREASED ACCIDENTS MAY NOT BE NEGATIVE
      IF(TEMP1.LT.0)TEMP1=0
C
C   *** INCREASED ANNUAL ACCIDENTS IS FACTORED BY THE PORTION OF YEAR
C   ***WHICH  THE CLOSURE WAS IN EFFECT
      TEMP5=TEMP1/365
      DO 6230 IH=IBEGIN,IEND
C
C   ***CONVERT ACCIDENTS/DAY TO ACCIDENTS /HOUR
      TEMP1=TEMP5*PCTADT(IH,7,ID,1)*DAYS
C
C   ***SET INCREASED ACCIDENTS OF DETOUR ROUTE TRAFFIC TO ZERO
      TEMP3=0
C
C   ***COMPUTE DECELERATION RATE OF FREEWAY MOTORIST
      FACT1=(SPEEDN(IH)**2+SPEED(IH)**2)/(2*SCZONE)
C
C   ***IF A DELAY EXISTS DECELERATE TO ZERO
      IF(DELAY(IH).GT.0)FACT1=SPEEDN(IH)**2/(2*SCZONE)
C
C   *** COMPUTE THE INCREASE ACCIDENT RATE DUE TO DECELERATION
      TEMP2=-1.32+.002*FACT1
C   ***INCREASED ACCIDENT MAY NOT BE NEGATIVE
      IF(TEMP2.LT.0)TEMP2=0
C
C   *** CONVERT ACCIDENT RATE TO ACCIDENTS
      TEMP2=TEMP2/1000*HVOL(IH)*SCZONE*DAYS
C
```

```
C   ***IF ALL LANES ARE CLOSED AND NO SHOULDERS ARE OPEN SKIP DETOUR
      IF(IC.NE.LANES)GOTO 6231
      IF(OVER(12,IA).GT.0)GOTO 6231
C
C   ***COMPUTE THE DECELERATION RATE OF TRAFFIC ON THE DETOUR
      FACT2=(SPEEDD(IH)**2-SPEED(IH)**2)/(2*SCZONE)
C
C   ***IF A DELAY EXISTS DECELERATE TO ZERO
      IF(DELAY(IH).GT.0)FACT2=SPEEDD(IH)**2/(2*SCZONE)
C
C   ***COMPUTE THE ACCIDENT RATE DUE TO DECELERATION ON DETOUR
      TEMP3=-1.32+.002*FACT2
C
C   ***ACCIDENT RATE MAY NOT BE NEGATIVE
      IF(TEMP3.LT.0)TEMP3=0
C
C   ***CONVERT ACCIDENT RATE TO ACCIDENTS
      TEMP3=TEMP3/1000*DVOL(IH)*SCZONE*DAYS
C
C   ***COMPUTE THE TOTAL INCREASED ACCIDENTS
 6231 TEMP4=TEMP1+TEMP2+TEMP3
C
C   ***ACCUMULATE ACCIDENTS FOR YEAR
      ACDTS(IC)=ACDTS(IC)+TEMP4
 6230 CONTINUE
      GOTO 5001
 5100 CONTINUE
      DO 6050 IC=1,LANES
C
C   ***CONVERT ACCIDENTS FOR YEAR TO COSTS AND HOLD BY ACTIVITY
C   ***AND CLOSURE
      COSTS(IA,IC,3,ID)=COSTS(IA,IC,3,ID)+ACDTS(IC)*AACOST
C
C   ***HOLD POLUTION DAYS
      COSTS(IA,IC,7,ID)=POLUTE(IC)
 6050 CONTINUE
C
C   ***BRANCH TO APPROPRIATE FREEWAY TYPE
      GOTO(5910,5920,5930),KP
C
C   ***FOUR LANE DIVIDED
C
 5910 CONTINUE
C
C   ***ACCUMULATE COSTS FOR ALL MOTOR PARAMETERS
      DO 5911 J=2,7
      TEMP1=COSTS(IA,1,J,ID)
C
C   ***CLOSE BOTH LANES AND DETOUR TRAFFIC
      COSTS(IA,1,J,ID)=COSTS(IA,2,J,ID)
C
C   ***CLOSE ONE LANE AT A TIME
      COSTS(IA,2,J,ID)=TEMP1*2
C
```

```
C  ***TEST FOR COMPUTABLE CROSSOVER
      IF(CROSS(1).EQ.0)GOTO 5000
C
C  ***CLOSE BOTH LANES AND CROSS OVER TO ONE LANE OPEN
      COSTS(IA,3,J,ID)=TEMP1*(CROSS(2)/CROSS(1))*2
 5911 CONTINUE
      GOTO 5000
C
C  ***SIX LANE DIVIDED
C
 5920 CONTINUE
C
C  ***ACCUMULATE COSTS FOR ALL MOTOR PARAMETERS
      DO 5921 J=2,7
      TEMP1=COSTS(IA,1,J,ID)
      TEMP2=COSTS(IA,2,J,ID)
C
C  ***CLOSE ALL THREE LANES AND DETOUR TRAFFIC
      COSTS(IA,1,J,ID)=COSTS(IA,3,J,ID)
C
C  ***CLOSE TWO LANES THEN CLOSE ONE LANE
      COSTS(IA,2,J,ID)=TEMP2+TEMP1
C
C  ***CLOSE ONE LANE AT A TIME
      COSTS(IA,3,J,ID)=TEMP1*3
C
C  ***TEST FOR COMPUTABLE CROSSOVER
      IF(CROSS(2).EQ.0)GOTO 5000
C
C  ***COMPUTE CROSS OVER FACTOR FOR ONE LANE CLOSED
      TEMP3=CROSS(3)/CROSS(1)
C
C  ***COMPUTE CROSS OVER FACTOR FOR TWO LANES CLOSED
      TEMP4=CROSS(3)/CROSS(2)
C
C  ***CLOSE ALL THREE LANES AND CROSS OVER TO ONE LANE OPEN
      COSTS(IA,4,J,ID)=TEMP1*TEMP3+TEMP2*TEMP4
 5921 CONTINUE
      GOTO 5000
C
C  ***EIGHT LANE DIVIDED
C
 5930 CONTINUE
C
C  ***ACCUMULATE COSTS FOR ALL MOTOR PARAMETERS
      DO 5931 J=2,7
      TEMP1=COSTS(IA,1,J,ID)
      TEMP2=COSTS(IA,2,J,ID)
C
C  ***CLOSE ALL FOUR LANES AND DETOUR TRAFFIC
      COSTS(IA,1,J,ID)=COSTS(IA,4,J,ID)
C
C  ***CLOSE THREE LANES THEN CLOSE ONE LANE
      COSTS(IA,2,J,ID)=COSTS(IA,3,J,ID)+TEMP1
```

```
     ***CLOSE TWO LANES AT A TIME
      COSTS(IA,3,J,ID)=TEMP2*2
C
C   ***CLOSE ONE LANE AT A TIME
      COSTS(IA,4,J,ID)=TEMP1*4
C
C   ***TEST FOR COMPUTABLE CROSSOVER
      IF(CROSS(2).EQ.0)GOTO 5000
C
C   ***CLOSE ALL FOUR LANES AND CROSS OVER TO TWO LANES
      COSTS(IA,5,J,ID)=TEMP2*(CROSS(4)/CROSS(2))*2
 5931 CONTINUE
 5000 CONTINUE
      RETURN
      END
```

```
                      -----------
                     /          /
                     -----------
                          I
                          I
                          I        01
                *--------------------*
                I       MI = 1       I
                I                    I
                I       MO = 3       I
                *--------------------*
                          I
                          I
                          I        02
                *--------------------*
                I1 I                 H
                I0 I     INITAL      H
                I. I                 H
                I0 I                 H
                I1 I                 H
                *--------------------*
                          I
                          I
                          I        03
                *--------------------*
                I2 I                 H
                I9 I     OPPARA      H
                I. I                 H
                I0 I                 H
                I1 I                 H
                *--------------------*
                          I
                          I
                          I
                          *    04
                        *   *
                      *       *
               TRUE *           *
            *-----* JPRINT .NE. 1 *
            I       *           *
            I         *       *
            I           *   *
            I             *
            I             IFALSE
            I             I
            I             I
            I             I
            I             I
            I             I
            I             I        05
            I   *--------------------*
            I   I3 I                 H
            I   I9 I     RPRINT      H
            I   I. I                 H
            I   I0 I                 H
            I   I1 I                 H
            I   *--------------------*
            I             I
            *------------>I
                   100    I  NOTE  06
                * * * * * * * * * * *
                *      CONTINUE     *
                * * * * * * * * * * *
                          I
                          I
                          I        07
                *--------------------*
                I4 I                 H
                I9 I      YEAR       H
                I. I                 H
                I0 I                 H
                I1 I                 H
                *--------------------*
                          I
                          I
                          I 08
                      ---------
                      * HALT  *
                      ---------

                  RETURN TO SYSTEM
```

```
      -----------
     /  INITAL  /
     -----------

 02.02--->*

 ***END OF DATA TEST
VARIABLE



 ***CAPACTIES BY
EXPRESSWAY TYPE AND
CLOSURE



 ***DESIGN SPEED




 ***TRAFFIC
DISTRIBUTIONS
BALANCING INDICES



 ***ALLOWABLE
OCCUPANCY INTERVAL



 ***DEFAULT VALUES
FOR THE SIMULATION
PROCESS FOR THREE
PAVEMENT TYPES




 ***TRAFFIC
DISTRIBUTION BETWEEN
TRIP PURPOSES





 ***INPUT INITIAL AND
FINAL ANALYSIS YEAR
VOLUME,AM PEAK SPLIT
AND % T

            *
            I           01
     ----------------
    / READ FROM DEV /
   /       MI       /
  /  VIA FORMAT    /
 /        8       /
/ INTO THE LIST /
----------------
            I
            I
            I   NOTE   02
* * * * * * * * * * *
*     LIST =         *
*     (VOLUME(J),    *
*       SPLIT(J),    *
*    TRUCKS(J),J =   *
*          1,2)      *
* * * * * * * * * * *
            I
            I
            I
 ***INPUT ANALYSIS
YEARS,PAVEMENT
TYPE,PROJECT LENGTH
IN MILES, AND PA
 ***THICKNESS FOR
SURFACE,BASE AND
SUBGRADE
 ***
PAVEMENT TYPES
 ***            1.
CONCRETE
 ***            2.
BITUMINOUS
 ***            3.
COMPOSITE
            I
            I
            I           03
     ----------------
    / READ FROM DEV /
   /       MI       /
  /  VIA FORMAT    /
 /        9       /
/ INTO THE LIST /
----------------
            I
            I
            +-------------+
```

```
+------------------>*
                    I  NOTE  04
      * * * * * * * * * * *
      *  LIST = NYEARS,    *
      *    KP, ITYPE,      *
      *  PROJLN, THICK1,   *
      *  THICK2, THICK3    *
      * * * * * * * * * * *
                    I
                    I
                    I         05
      *--------------------*
      I  LANES = KP + 1    I
      *--------------------*
                    I
                    I
                    I
       ***ESTABLISHMENT OF
      THE DEFAULT OPTION
      FOR WORKSITE
      SIMULATION GIVEN
                    I
                    I
                    I  NOTE  06
      * * * * * * * * * * *
      *   BEGIN DO LOOP    *
      *  1050 IA = 1, 7    *
      * * * * * * * * * * *
                    I
                    I<------------+
                    I  NOTE  07   I
      * * * * * * * * * * *      I
      *   BEGIN DO LOOP    *      I
      *   1051 J = 1, 5    *      I
      * * * * * * * * * * *      I
                    I             I
  +------------>I                 I
  I    1051     I        08       I
  I   *--------------------*      I
  I   I     SIM(IA,J) =    I      I
  I   I SSIM(IA,ITYPE,J)   I      I
  I   *--------------------*      I
  I                 I             I
  I                 I             I
  I                 I             I
  I                 *     09      I
  I               *   *           I
  I             *       *         I
  I  NO       *           *       I
  +------*      END OF DO    *    I
              *   LOOP?    *      I
                *       *         I
                  *   *           I
                    *             I
                    IYES          I
                    I             I
                    I             I
                    I             I
                    I             I
                    I             I
        1050        *     10      I
                  *   *           I
                *       *         I
              *           *   NO  I
           *    END OF DO    *-----+
              *   LOOP?    *
                *       *
                  *   *
                    *
                    IYES
                    I
                    I
                    I
                    I
                    I
       ***ESTABLISH DEFALUT
      OPTION FOR CAPACITY
                    I
                    I
                    I  NOTE  11
      * * * * * * * * * * *
      *   BEGIN DO LOOP    *
      *   1060 J = 1, 5    *
      * * * * * * * * * * *
                    I
  10.13--->I
                    I         12
      *--------------------*
      I      CAP(J) =      I
      I    CCAP(J,KP)      I
      *--------------------*
                    I
                    I
                    +-------------------+
```

```
+------------->*
               I
     1060      *     13
             *   *
           *       *
         *           *    NO
      *    END OF DO    *-+
         *   LOOP?    *   I
           *       *      I
             *   *        I
               *         ....
               IYES     . 10 .
               I        . 12 .
               I         ....
               I
               I
               I
               I
 ***INITIALIZE
REMAINDER OF TRAFFIC
DISTRIBUTIONS
               I
               I
     1000      I  NOTE  14
* * * * * * * * * * *
*     CONTINUE        *
* * * * * * * * * * *
               I
               I
               I  NOTE  15
* * * * * * * * * * *
*   BEGIN DO LOOP     *
*  1010 IT = 1, 6     *
* * * * * * * * * * *
               I
 11.06--->I
               I
**  TEST FOR
DIRECTIONS 1&2
IDENTICAL
               I
               I
               I          16
*--------------------*
I  COMPUTED GO TO    I
I     FOR  IT        I
*--------------------*
I  1032       11.02  I
I  1020       10.17  I
I  1020       10.17  I
I  1020       10.17  I
I  1032       11.02  I
I  1020       10.17  I
*--------------------*
               I
               I
               I
IF OUTSIDE THE RANGE
               I
 10.16*-->I
     1020      I  NOTE  17
* * * * * * * * * * *
*     CONTINUE        *
* * * * * * * * * * *
               I
               I
               I
**  INITIALIZE
DIRECTION 2
               I
               I
               I  NOTE  18
* * * * * * * * * * *
*   BEGIN DO LOOP     *
*  1030 IH = 1, 24    *
* * * * * * * * * * *
               I
 11.01--->I
               I          19
*--------------------*
I PCTADT(IH,IT,2,1)  I
I         =          I
I PCTADT(IH,IT,1,1)  I
*--------------------*
               I
               I
               I
               I  /
             -----
            /11.01
```

```
10.19--->*
         I
  1030   *   01
       *   *
     *       *
   *           *   NO
 *   END OF DO   *-+
   *   LOOP?   *   I
     *       *     I
       *   *       I
         *       ....
         IYES   . 10 .
         I      . 19 .
         I       ....
         I
         I
10.16*-->I
  1032   I  NOTE  02
* * * * * * * * * * *
*      CONTINUE     *
* * * * * * * * * * *
         I
         I
         I
** INITIALIZE FINAL
VOLUME DISTRIBUTIONS
         I
         I
         I  NOTE  03
* * * * * * * * * * *
*   BEGIN DO LOOP   *
*  1031 IH = 1, 24  *
* * * * * * * * * * *
         I
+------------>I
I             I          04
I  *--------------------*
I  I PCTADT(IH,IT,1,2) I
I  I        =          I
I  I PCTADT(IH,IT,1,1) I
I  I                   I
I  I PCTADT(IH,IT,2,2) I
I  I        =          I
I  I PCTADT(IH,IT,2,1) I
I  *--------------------*
I             I
I             I
I             I
I     1031    *    05
I           *   *
I         *       *
I  NO   *           *
+-----*   END OF DO   *
        *   LOOP?   *
          *       *
            *   *
              *
              IYES
              I
              I
              I
              I
              I
              I
  1010        *    06
            *   *
          *       *
        *           *   NO
      *   END OF DO   *-+
        *   LOOP?   *   I
          *       *     I
            *   *       I
              *       ....
              IYES   . 10 .
              I      . 16 .
              I       ....
              I
              I
              I
              I
** DETERMINATION OF
AN AASHO BASED ANNUAL
18 KIP AXLES FACTOR
              I
              I
              I          07
*--------------------*
I  COMPUTED GO TO   I
I     FOR ITYPE     I
*--------------------*
I 1100       11.08 I
I 1101       11.09 I
I 1101       11.09 I
*--------------------*
              I
              I
              +-------------+
```

```
+------------------->*
                     I
IF OUTSIDE THE RANGE
                     I
                     I
                     I
** AASHO BASED
ACCUMULATED 18 KIP
AXLES TO 1.5 PSI AS A
FUNCTION THIC
                     I
11.07--->I
   1100   I          08
*--------------------*
I        RHD =       I
I   .88*ITHICK1 +    I
I     1)**7.35       I
*--------------------*
                     I
                     I
                     +-------------+
```

```
** AASHO THICKNESS
FACTOR FOR BITUMINOUS
PAVEMENTS

11.07*-->*
  1101    I           09
*--------------------*
I       THICK =      I
I   .44*THICK1 +     I
I   .14*THICK2 +     I
I     .1*THICK3      I
*--------------------*
          I
          I
          I
** AASHO BASED
ACCUMULATED 18 KIP
AXLES TO 1.5 PSI AS A
FUNCTION THIC
          I
          I
          I          10
*--------------------*
I       RHD =        I
I  2.26*(THICK +     I
I     1)**8.94       I
*--------------------*
          I
+------------------->I
I    1102  I          11
I *--------------------*
I I       ARHD =       I
I I   RHD/20000000     I
I *--------------------*
I          I
I          I
I   1105   I  NOTE  12
I * * * * * * * * * * *
I *      CONTINUE     *
I * * * * * * * * * * *
I          I
I          I
I          I
I ** READ TYPE OF
I OVERRIDE OR END OF
I OVERRRIDES
I          I
I 12.07*-->I
I   1200   I          13
I    ----------------
I     / READ FROM DEV /
I    /       MI      /
I   /  VIA FORMAT   /
I  /       I       /
I / INTO THE LIST /
I ----------------
I          I
I          I
I          I  NOTE  14
I * * * * * * * * * * *
I *  LIST = IP, END   *
I * * * * * * * * * * *
I          I
I          I
I          I
I ** TEST FOR END OF
I OVERRIDE DATA
I          I
I          I
I          I
I          *   15
I        *   *
I      *       *
I    *           *  TRUE
I  *   END .EQ.    *-+
I    *  ENDVER   *   I
I      *       *     I
I        *   *       I
I          *       ....
I          IFALSE . 17 .
I          I      . 01 .
I          I       ....
I          I       1299
I          I
I          I
I          I
I ** GO TO PROPER
I OVERRIDE ROUTINE
I ** THE OVERRIDE
I SWITCHES ARE
I SUMMARIZED AS
I FOLLOWS:
I          I
I          I
+----------+-------------+
```

```
+------------------->*
I                    I
I **                 1.
I HOURLY VOLUME
I DISTRIBUTION BY TRIP
I PURPOSE
I **                 2.
I PERCENT OF TOTAL
I VOLUME BY TRIP
I PURPOSE
I **                 3.
I DIRECTIONAL BALANCING
I SWITCH
I **                 4.
I PERMITTED OCCUPANCY
I INTERVAL BY ACTIVITY
I **               5. A
I RANGE OF OVERRIDE
I PARAMETERS BY
I ACTIVITY
I **                 6.
I VERTICAL AND
I HORZONTAL ALIGNMENT
I **                 7.
I VEHICLE
I CLASSIFIACTION DATA
I **                 8.
I MAINTENANCE
I SIMULATION PARAMETERS
I **                 9.
I UNIT OPERATING COSTS
I **                10.
I PRINT SWITCH
I **                11.
I PAVEMENT LANE WIDTH
I **                12.
I INCOME LEVEL
I **                13.
I SPEEDS FOR WALKING
I AND TRAVELING ON
I ROADWAY BY MAI
I **                14.
I TERMINAL PSI VALUE
I **                15.
I DETOUR PARAMETERS
I **                16.
I DESIGN LIFE
I **                17.
I ACTIVITY STANDARD
I **                18.
I CLOSURE CAPACITIES
I **                19.
I FREEWAY DESIGN SPEED
I **                20.
I AVERAGE ACCIDENT
I COSTS
I **                21.
I VEHICLE OCCUPANCY
I **                22.
I COMMERCIAL VALUE OF
I TIME
I **                23.
I SPEED LIMITS
I          I
I          I
I          I          17
I *--------------------*
I I  COMPUTED GO TO   I
I I      FOR IP       I
I *--------------------*
I I 1201       12.04 I
I I 1203       12.13 I
I I 1205       12.20 I
I I 1206       13.01 I
I I 1208       13.13 I
I I 1209       14.01 I
I I 1210       14.07 I
I I 1212       14.12 I
I I 1220       14.19 I
I I 1225       15.03 I
I I 1226       15.05 I
I *--------------------*
I          I
I          I
I          I
I IF OUTSIDE THE RANGE
I          I
I          I
I          I          18
I *--------------------*
I I   IP = IP - 11    I
I *--------------------*
I          I
I          I
I          I
I          I  /
I        -----
I        /12.01
+
```

```
 11.18--->*
          I         01
*-------------------*
I   COMPUTED GO TO  I
I       FOR  IP     I
*-------------------*
I  1227        15.07 I
I  1228        15.09 I
I  1229        15.11 I
I  1230        15.13 I
I  1231        15.15 I
I  1232        16.01 I
I  1234        16.07 I
I  1235        16.09 I
I  1236        16.11 I
I  1237        16.13 I
I  1238        16.15 I
*-------------------*
          I
          I
          I
IF OUTSIDE THE RANGE
          I
          I
          I         02
*-------------------*
I   IP = IP - 11    I
*-------------------*
          I
          I
          I         03
*-------------------*
I   COMPUTED GO TO  I
I       FOR  IP     I
*-------------------*
I  1239        16.17 I
*-------------------*
          I
          I
          I
IF OUTSIDE THE RANGE
          I
          I
          I
 *****  PACKET NUMBER
1
          I
          I
          I
**  READ TRIP
PURPOSE, DIRECTION,
VOLUME LEVEL,& HOURLY
DISTRIBUTION
 ***SWITCHES FOR TRIP
PURPOSE
 ***               1.
WORK TRIPS
 ***               2.
PERSONAL BUSINESS
TRIPS
 ***               3.
SOCIAL-RECREATIONAL
TRIPS
 ***               4.
SCHOOL TRIPS
 ***               5.
VACATION TRIPS
 ***               6.
COMMERCIAL TRIPS
          I
 11.17*-->I
  1201    I         04
   ----------------
   / READ FROM OEV /
  /      MI       /
 /  VIA FORMAT   /
/      2        /
/ INTO THE LIST /
----------------
          I
          I
          I  NOTE  05
* * * * * * * * * * *
*  LIST = IT, ID,   *
* LEVEL, (Z(I),I =  *
*      1,24)        *
* * * * * * * * * * *
          I
          I
          I
**  TEST FOR END OF
HOURLY DISTRIBUTION
OVERRIDE
          I
          I
          +-------------+
```

```
+------------------->*
                     I
                     *    07
                   *   *
                 *       *
               *           *  TRUE
             *   IT .EQ. 0   *-+
               *           *   I
                 *       *     I
                   *   *       I
                     *       ....
                     IFALSE . 11 .
                     I      . 13 .
                     I       ....
                     I       1200
                     I
                     I
**  SET INDEX TO
INDICATE OVERRIDDEN
DISTRIBUTIONS
                     I
                     I
                     I          08
*--------------------*
I IBAL(IT,IO,LEVEL) I
I          = 1       I
*--------------------*
                     I
                     I
                     I
**  REPLACE OLD WITH
NEW DISTRIBUTION
                     I
                     I
                     I  NOTE  09
* * * * * * * * * * *
*   BEGIN DO LOOP   *
*  1202 I = 1, 24   *
* * * * * * * * * * *
                     I
+------------->I
I                    I          10
I   *--------------------*
I   I  PCTADT(I,IT,ID,  I
I   I   LEVEL) = Z(I)   I
I   *--------------------*
I                    I
I                    I
I                    I
I      1202      *    11
I              *   *
I            *       *
I  NO      *           *
+-----*   END OF DO    *
           *   LOOP?   *
             *       *
               *   *
                 *
                 IYES
                 I
                 I
                 I
                 I
                 I
**  GET NEXT HOURLY
DISTRIBUTION
                 I
                 I
                 I 12
                ...
              .     .
              .12.04.
              .     .
                ... 1201
```

```
 *****  PACKET NUMBER
2

**  READ DIRECTION,
VOLUME LEVEL,& TRIP
PURPOSE DISTRIBUTION

 11.17*-->*
  1203    I          13
   ----------------
   / READ FROM OEV /
  /      MI       /
 /  VIA FORMAT   /
/      4        /
/ INTO THE LIST /
----------------
          I
          I
          I  NOTE  14
* * * * * * * * * * *
* LIST = IO, LEVEL, *
*  (Z(I),I = 1,6)   *
* * * * * * * * * * *
          I
          I
          I
**  TEST FOR END OF
TRIP PURPOSE
DISTRIBUTIONS
OVERRIDES
          I
          I
          I
          *    15
        *   *
      *       *
    *           *  TRUE
  *   ID .EQ. 0   *-+
    *           *   I
      *       *     I
        *   *       I
          *       ....
          IFALSE . 11 .
          I      . 13 .
          I       ....
          I       1200
          I
          I
          I
**  REPLACE OLD WITH
NEW TRIP PURPOSE
DISTRIBUTION
          I
          I
          I  NOTE  16
* * * * * * * * * * *
*   BEGIN DO LOOP   *
*   1204 I = 1, 6   *
* * * * * * * * * * *
          I
+------------->I
I             I          17
I   *--------------------*
I   I   PERCNT(I,IO,    I
I   I   LEVEL) = Z(I)   I
I   *--------------------*
I             I
I             I
I             I
I     1204    *    18
I           *   *
I         *       *
I  NO   *           *
+-----*   END OF DO   *
        *   LOOP?   *
          *       *
            *   *
              *
              IYES
              I
              I
              I
              I
              I
**  GET NEXT TRIP
PURPOSE DISTRIBUTION
OVERRIDE
              I
              I
              I 19
             ...
           .     .
           .12.13.
           .     .
             ... 1203
```

```
 *****  PACKET NUMBER
3

**  SET INDICATOR TO
COMBINE AM & PM PEAKS

 11.17--->*
  1205    I          20
*--------------------*
I     IDIR = 3       I
*--------------------*
          I
          I
          I
         ...
       .     .
       .11.13.
       .     .
         ... 1200
```

```
 *****  PACKET NUMBER
4

 11.17--->*
  1206    I   NOTE  01
* * * * * * * * * * *
*      CONTINUE      *
* * * * * * * * * * *
          I
          I
          I   NOTE  02
* * * * * * * * * * *
*   BEGIN DO LOOP    *
*   1207 I = 1, 9    *
* * * * * * * * * * *
          I
          I<-------------------+
          I                    I
**  OVERRIDE ALLOWED           I
OCCUPANCY HOURS                I
          I                    I
          I                    I
          I                    I
**  READ ACTIVITY              I
NUMBER, START TIME,            I
FINISH TIME                    I
          I                    I
          I                    I
          I          03        I
    ----------------           I
   / READ FROM DEV /     +-----I------------>*
  /       MI      /      I     I             I
 /   VIA FORMAT  /       I     I             *    08
/        2      /        I     I           *   *
/ INTO THE LIST /        I     I         *       *
----------------         I     I       *           *  TRUE
          I              I     I     *  INUCC(I,1)   *-+
          I              I     I       *  .EQ. 0   *   I
          I   NOTE  04   I     I         *       *     I
* * * * * * * * * * *    I     I           *   *       I
*      LIST =        *   I     I             *       ....
*  (INOCC(I,J),J =   *   I     I             IFALSE . 11 .
*       1,3)         *   I     I             I      . 13 .
* * * * * * * * * * *    I     I             I       ....
          I              I     I             I       1200
          I              I     I             I
          I              I     I             I
 ***IF OCCUPANCY         I     I  **  GET NEXT
TIME FOR ALL             I     I  OCCUPANCY HOUR
ACTIVITIES IS            I     I  OVERRIDE
INPUT,'INOCC(I,1)=10'    I     I             I
THE                      I     I             I
 ***THE DEFALT OPTION    I     I             I
IS OVERRIDEN             I     I     1207    *    09
          I              I     I           *   *
          I              I     I         *       *
          I              I     I  NO   *           *
          *    05        I     +-----*   END OF DO   *
        *   *            I             *   LOOP?   *
      *       *          I               *       *
FALSE *         *        I                 *   *
+-----*  INOCC(I,1)  *   I                   *
I       *  .EQ. 10  *    I                   IYES
I         *       *      I                   I
I           *   *        I                   I
I             *          I                   I
I             ITRUE      I                   I
I             I          I                   I
I             I          I                   I
I             I          I  **  DUMMY READ OF
I             I          I  BLANK CARD FOLLOWING
I             I     06   I  NINE OVERRIDES
I  *--------------------*I                   I
I  I  INOCC(10,1) = 0  I I                   I
I  *--------------------*I                   I         10
I             I          I             ----------------
+------------>I          I            / READ FROM DEV /
              I          I           /       MI      /
**  TEST FOR END OF      I          /   VIA FORMAT  /
OCCUPANCY HOURS          I         /        1      /
OVERRIDES                I        / INTO THE LIST /
          I              I        ----------------
          I              I                   I
          +--------------+                   I
                                             I   NOTE  11
                                  * * * * * * * * * * *
                                  *      LIST = I1     *
                                  * * * * * * * * * * *
                                             I
                                             I
                                             I
                                  **  GET NEXT TYPE OF
                                  OVERRIDE
                                             I
                                             I
                                             I 12
                                            ...
                                           .   .
                                           .11.13.
                                           .   .
                                            ... 1200
```

```
 *****  PACKET NUMBER
5


**  READ OVER TYPE,
ACTIVITY, AND VALUE
 ***SWITCHES FOR
OVERRIDE PARAMETERS
 ***                1.
CONTINOUS CREW WORK
HOURS
 ***                2.
LOCATION OR JOINT
SPACING
 ***                3.
WORKLOAD MODEL FACTOR
 ***                4.
WORKLOAD MODEL FIXED
ANNUAL RATE
 ***                5.
TRAVEL TIME HOURS
 ***                6.
MAINTENANCE LEVEL
 ***                7.
CURE TIME IN HOURS
 ***                8.
TRAFFIC CONTROL
INSTALLATION TIME IN
HOURS
 ***                9.
MAXIMUM TRAFFIC
CONTROL ZONE LENGTH
IN MILES
 ***               10.
VOLUME/CAPACITY RATIO
ALLOWED
 ***               11.
MINIMUM TRAFFIC
CONTROL LENGTH IN
MILES
 ***               12.
SHOULDERS OPEN

 11.17*-->*
  1208    I          13
    ----------------
   / READ FROM DEV /
  /       MI      /
 /   VIA FORMAT  /
/        3      /
/ INTO THE LIST /
----------------
          I
          I
          I   NOTE  14
* * * * * * * * * * *
*  LIST = I1, IA,    *
*       VALUE        *
* * * * * * * * * * *
          I
          I
          I
**  TEST FOR END OF
OVER OVERRIDES
          I
          I
          I
          *    15
        *   *
      *       *
    *           *  TRUE
  *   I1 .EQ. 0   *-+
    *           *   I
      *       *     I
        *   *       I
          *       ....
          IFALSE . 11 .
          I      . 13 .
          I       ....
          I       1200
          I
          I
          I              +------------------->*
**  REPLACE ASSUMED      I                    I          17
VALUE WITH OVERRIDE      I             *--------------------*
VALUE                    I             I  OVER(I1,IA) =    I
          I              I             I      VALUE        I
          I              I             *--------------------*
          +--------------+                    I
                                              I
                                              I
                                       **  GET NEXT OVER
                                       OVERRIDE
                                              I
                                              I
                                              I 18
                                             ...
                                            .   .
                                            .13.13.
                                            .   .
                                             ... 1208
```

```
***** PACKET NUMBER
6

***DESIGN
ALIGNMENT,VERTICAL
AND HORIZONTAL

 11.17*-->*
  1209    I   NOTE  01
* * * * * * * * * * *
*     CONTINUE        *
* * * * * * * * * * *
          I
          I
          I
***READ ALIGNMENT
TYPE'+GRADE,-GRADE,
DEGREES',MAGNITUDE
AND MILEAGE
          I
          I
          I         02
    ----------------
   / READ FROM DEV /
  /       MI      /
 /  VIA FURMAT   /
/       3       /
/ INTO THE LIST /
----------------
          I
          I
          I   NOTE  03
* * * * * * * * * * *
*  LIST = I1, I2,     *
*       VALUE         *
* * * * * * * * * * *
          I
          I
          I
***TEST FOR END OF
OVERRIDE
          I
          I
          I
          *   04
        *   *
      *       *
    *           *  TRUE
  *   I1 .EQ. 0   *-+
    *           *   I
      *       *     I
        *   *       I
          *        ....
          IFALSE . 11 .
          I      . 13 .
          I        ....
          I        1200
          I
          I
***REPLACE ASSUMED
VALUE WITH OVERRIDE
VALUE
          I
          I
          I         05
*--------------------*
I  ALIGN(I1,I2) =    I
I       VALUE        I
*--------------------*
          I
          I
          I
***GET NEXT OVERRIDE
          I
          I
          I 06
         ...
        .   .
        .14.01.
        .   .
         ... 1209
```

```
***READ VEHICLE
WEIGHT, PERCENTAGE
AND COSTS, NOTE THAT
FIRST CARD
***MUST BE PASSENGER
VEHICLES


***** PACKET NUMBER
7

 11.17--->*
  1210    I          07
*--------------------*
I       IWT = 0      I
*--------------------*
          I
+------------->I
I     1211    I          08
I       ----------------
I      / READ FROM DEV /
I     /       MI      /
I    /  VIA FORMAT   /
I   /       5       /
I   / INTO THE LIST /
I   ----------------
I             I
I             I
I             I   NOTE  09
I   * * * * * * * * * * *
I   * LIST = Z(J),J =     *
I   *        1,3)         *
I   * * * * * * * * * * *
I             I
I             I
I             I
I   ***TEST FOR END OF
I   OVERRIDE
I             I
I             I
I             I
I             *   10
I           *   *
I         *       *
I       *           *  TRUE
I     *   Z(1) .EQ. 0  *-+
I       *           *   I
I         *       *     I
I           *   *       I
I             *        ....
I             IFALSE . 11 .
I             I      . 13 .
I             I        ....
I             I        1200
I             I
I             I
I             I          11
I   *--------------------*
I   I   IWT = IWT + 1    I
I   I                    I
I   I  WEIGHT(IWT,1) =   I
I   I      Z(1)          I
I   I                    I
I   I  WEIGHT(IWT,2) =   I
I   I     Z(2)/100       I
I   I                    I
I   I  WEIGHT(IWT,3) =   I
I   I      Z(3)          I
I   *--------------------*
I             I
I             I
+-------------+
```

```
***** PACKET NUMBER
8


***READ ACTIVITY AND
SIMULATION PARAMETERS
***               1.
WORKSITE TYPE
***               2.
WORKSITE FACTOR
***               3.
ADD ON VALUE
***               4.
NUMBER OF ITERATIONS
***               5.
RANDOM OR UNIFORM
LOCATIONS

 11.17*-->*<-------------+
  1212    I   NOTE  12   I
* * * * * * * * * * *    I
*     CONTINUE        *  I
* * * * * * * * * * *    I
          I              I
          I              I
          I         13   I
    ----------------     I
   / READ FROM DEV /     I
  /       MI      /      I
 /  VIA FORMAT   /       I
/       6       /        I
/ INTO THE LIST /        I
----------------         I
          I              I
          I              I
          I   NOTE  14   I
* * * * * * * * * * *    I
*     LIST = IA,      *  I
*  Z(J),J = 1,5)      *  I
* * * * * * * * * * *    I
          I              I
          I              I
          I              I
***TEST FOR END OF       I
OVERRIDE                 I
          I              I
          I              I
          I              I
          *   15         I
        *   *            I
      *       *          I
    *           *  TRUE  I
  *   IA .EQ. 0   *-+    I
    *           *   I    I
      *       *     I    I
        *   *       I    I
          *        ....  I
          IFALSE . 11 .  I
          I      . 13 .  I
          I        ....  I
          I        1200  I
          I              I
          I              I
          I   NOTE  16   I
* * * * * * * * * * *    I
*  BEGIN DO LOOP      *  I
*  1213 I = 1, 5      *  I
* * * * * * * * * * *    I
          I              I
+------------->I         I
I   1213    I        17  I
I  *--------------------* I
I  I SIM(IA,I) = Z(I)  I I
I  *--------------------* I
I           I            I
I           I            I
I           I            I
I           *   18       I
I         *   *          I
I       *       *        I
I  NO *           *      I
+-----*  END OF DO  *    I
        *  LOOP?  *      I
          *     *        I
            * *          I
             *           I
             IYES        I
             I           I
             I           I
             I           I
             I           I
             I           I
             +-----------+
```

```
***** PACKET NUMBER
9

+----11.17*-->*
I     1220    I          19
I      ----------------
I     / READ FROM DEV /
I    /       MI      /
I   /  VIA FORMAT   /
I  /       7       /
I  / INTO THE LIST /
I  ----------------
I             I
I             I
I             I   NOTE  20
I   * * * * * * * * * * *
I   *   LIST = I1,        *
I   *  Z(J),J = 1,2)      *
I   * * * * * * * * * * *
I             I
I             I
I             I
I             *   21
I           *   *
I         *       *
I       *           *  TRUE
I     *   I1 .EQ. 0   *-+
I       *           *   I
I         *       *     I
I           *   *       I
I             *        ....
I             IFALSE . 11 .
I             I      . 13 .
I             I        ....
I             I        1200
I             I
I             I
I             I          22
I   *--------------------*
I   I  COMPUTED GO TO    I
I   I     FOR  I1        I
I   *--------------------*
I   I  1221      14.23   I
I   I  1222      14.24   I
I   I  1223      15.01   I
I   I  1224      15.02   I
I   *--------------------*
I             I
I             I
I             I
I   IF OUTSIDE THE RANGE
I             I
I   14.22--->I
I     1221    I          23
I   *--------------------*
I   I  FUEL(1) = Z(1)    I
I   I                    I
I   I  FUEL(2) = Z(2)    I
I   *--------------------*
I             I
I             I
+-------------+
A
I
I
I
I
I
I
I
I
I
I
I
I      -----------
I     /   1222    /
I     -----------
I             I
I   14.22--->I
I             I          24
I   *--------------------*
I   I  TIRES(1) = Z(1)   I
I   I                    I
I   I  TIRES(2) = Z(2)   I
I   *--------------------*
I             I
I             I
+-------------+
```

```
     -----------
    /   1223   /
    -----------
         I
 14.22--->I
         I          01
*--------------------*
I   OIL(1) = Z(1)    I
I                    I
I   OIL(2) = Z(2)    I
*--------------------*
         I
         I
         I
        ...
       .   .
       .14.19.
       .   .
        ... 1220
```

```
     -----------
    /   1224   /
    -----------
         I
 14.22--->I
         I          02
*--------------------*
I   SINOEX = Z(1)    I
*--------------------*
         I
         I
         I
        ...
       .   .
       .14.19.
       .   .
        ... 1220
```

```
 *****  PACKET NUMBER
 10

 11.17--->*
   1225   I          03
          ----------------
         / READ FROM OEV /
        /      MI       /
       /  VIA FORMAT   /
      /       3       /
     / INTO THE LIST /
     ----------------
         I
         I
         I  NOTE  04
* * * * * * * * * * *
*  LIST = IPRINT,   *
*      JPRINT       *
* * * * * * * * * * *
       , I
         I
         I
        ...
       .   .
       .11.13.
       .   .
        ... 1200
```

```
 *****  PACKET NUMBER
 11

 11.17--->*
   1226   I          05
          ----------------
         / READ FROM OEV /
        /      MI       /
       /  VIA FORMAT   /
      /       8       /
     / INTO THE LIST /
     ----------------
         I
         I
         I  NOTE  06
* * * * * * * * * * *
*   LIST = WIDTH    *
* * * * * * * * * * *
         I
         I
         I
        ...
       .   .
       .11.13.
       .   .
        ... 1200
```

```
 *****  PACKET NUMBER
 12

 12.01--->*
   1227   I          07
          ----------------
         / READ FROM OEV /
        /      MI       /
       / . VIA FORMAT  /
      /       1       /
     / INTO THE LIST /
     ----------------
         I
         I
         I  NOTE  08
* * * * * * * * * * *
*    LIST = INC     *
* * * * * * * * * * *
         I
         I
         I
        ...
       .   .
       .11.13.
       .   .
        ... 1200
```

```
 *****  PACKET NUMBER
 13

 12.01--->*
   1228   I          09
          ----------------
         / READ FROM OEV /
        /      MI       /
       /  VIA FORMAT   /
      /       8       /
     / INTO THE LIST /
     ----------------
         I
         I
         I  NOTE  10
* * * * * * * * * * *
*   LIST = WALK,    *
*      TCMOVE       *
* * * * * * * * * * *
         I
         I
         I
        ...
       .   .
       .11.13.
       .   .
        ... 1200
```

```
 *****  PACKET NUMBER
 14

 12.01--->*
   1229   I          11
          ----------------
         / READ FROM OEV /
        /      MI       /
       /  VIA FORMAT   /
      /       8       /
     / INTO THE LIST /
     ----------------
         I
         I
         I  NOTE  12
* * * * * * * * * * *
*   LIST = PSIRS    *
* * * * * * * * * * *
         I
         I
         I
        ...
       .   .
       .11.13.
       .   .
        ... 1200
```

```
 *****  PACKET NUMBER
 15

 12.01--->*
   1230   I          13
          ----------------
         / READ FROM OEV /
        /      MI       /
       /  VIA FORMAT   /
      /       8       /
     / INTO THE LIST /
     ----------------
         I
         I
         I  NOTE  14
* * * * * * * * * * *
*      LIST =       *
*  (OETOUR(J),J =   *
*       1,7)        *
* * * * * * * * * * *
         I
         I
         I
        ...
       .   .
       .11.13.
       .   .
        ... 1200
```

```
 *****  PACKET NUMBER
 16

 12.01--->*
   1231   I          15
          ----------------
         / READ FROM OEV /
        /      MI       /
       /  VIA FORMAT   /
      /       8       /
     / INTO THE LIST /
     ----------------
         I
         I
         I  NOTE  16
* * * * * * * * * * *
*   LIST = DLIFE,   *
*       RLIFE       *
* * * * * * * * * * *
         I
         I
         I
        ...
       .   .
       .11.13.
       .   .
        ... 1200
```

```
***** PACKET NUMBER
17

 12.01*-->*<-------------+
   1232   I         01   I
    ----------------     I
    / READ FROM DEV /    I
   /       MI      /     I
  /  VIA FORMAT   /      I
 /        3      /       I
/ INTO THE LIST /        I
----------------         I
          I              I
          I              I
          I  NOTE  02    I
* * * * * * * * * * *    I
*  LIST = IA, I1,    *   I
*  IZ(J),J = 1,3)    *   I
* * * * * * * * * * *    I
          I              I
          I              I
          I              I
          *   03         I
       *     *           I
    *           *        I
  *               * TRUE I
 *   IA .EQ. 0    *--+   I
  *               *  I   I
    *           *    I   I
       *     *       I   I
          *        ....  I
          IFALSE . 11 .  I
          I      . 13 .  I
          I        ....  I
          I        1200  I
          I              I
          I              I
          I  NOTE  04    I
* * * * * * * * * * *    I
*   BEGIN DO LOOP    *   I
*   1233 J = 1, 3    *   I
* * * * * * * * * * *    I
          I              I
+----------->I           I
I         I         05   I
I  *-------------------* I
I  I  PS(IA,I1,J) =    I I
I  I      Z(J)         I I
I  *-------------------* I
I         I              I
I         I              I
I         I              I
I    1233 *    06        I
I      *     *           I
I   *           *        I
I NO *             *     I
+-----*  END OF DO   *   I
   *    LOOP?     *      I
    *           *        I
       *     *           I
          *              I
          IYES           I
          I              I
          I              I
          I              I
          I              I
          I              I
          +--------------+
```

```
***** PACKET NUMBER
18

 12.01--->*
   1234   I         07
    ----------------
    / READ FROM DEV /
   /       MI      /
  /  VIA FORMAT   /
 /        8      /
/ INTO THE LIST /
----------------
          I
          I
          I  NOTE  08
* * * * * * * * * * *
*      LIST =        *
* (CAP(J),J = 1,5)   *
* * * * * * * * * * *
          I
          I
          I
         ...
       .     .
       .11.13.
       .     .
         ... 1200
```

```
***** PACKET NUMBER
19

 12.01--->*
   1235   I         09
    ----------------
    / READ FROM DEV /
   /       MI      /
  /  VIA FORMAT   /
 /        8      /
/ INTO THE LIST /
----------------
          I
          I
          I  NOTE  10
* * * * * * * * * * *
*   LIST = DSPEED    *
* * * * * * * * * * *
          I
          I
          I
         ...
       .     .
       .11.13.
       .     .
         ... 1200
```

```
***** PACKET NUMBER
20

 12.01--->*
   1236   I         11
    ----------------
    / READ FROM DEV /
   /       MI      /
  /  VIA FORMAT   /
 /        5      /
/ INTO THE LIST /
----------------
          I
          I
          I  NOTE  12
* * * * * * * * * * *
*   LIST = AACOST    *
* * * * * * * * * * *
          I
          I
          I
         ...
       .     .
       .11.13.
       .     .
         ... 1200
```

```
***** PACKET NUMBER
21

 12.01--->*
   1237   I         13
    ----------------
    / READ FROM DEV /
   /       MI      /
  /  VIA FORMAT   /
 /        8      /
/ INTO THE LIST /
----------------
          I
          I
          I  NOTE  14
* * * * * * * * * * *
*  LIST = DCWORK,    *
*      DCSCHL        *
* * * * * * * * * * *
          I
          I
          I
         ...
       .     .
       .11.13.
       .     .
         ... 1200
```

```
***** PACKET NUMBER
22

 12.01--->*
   1238   I         15
    ----------------
    / READ FROM DEV /
   /       MI      /
  /  VIA FORMAT   /
 /        8      /
/ INTO THE LIST /
----------------
          I
          I
          I  NOTE  16
* * * * * * * * * * *
*   LIST = COMVOT    *
* * * * * * * * * * *
          I
          I
          I
         ...
       .     .
       .11.13.
       .     .
         ... 1200
```

```
***** PACKET NUMBER
23

 12.03--->*
   1239   I         17
    ----------------
    / READ FROM DEV /
   /       MI      /
  /  VIA FORMAT   /
 /        8      /
/ INTO THE LIST /
----------------
          I
          I
          I  NOTE  18
* * * * * * * * * * *
*      LIST =        *
*  ISLIMIT(J),J =    *
*       1,5)         *
* * * * * * * * * * *
          I
          I
          I
         ...
       .     .
       .11.13.
       .     .
         ... 1200
```

```
 -----------
/   1299   /
 -----------
      I
11.15--->I
      I  NOTE  01
* * * * * * * * * * *
*     CONTINUE      *
* * * * * * * * * * *
      I
***ARRAYS ARE
ESTABLISHED FOR FULL
DEPTH AND PARTIAL
DEPTH PATCH SIZE
***AND RANDOM
LOCATIONS ALONG THE
ROADWAY
      I
** INITIALIZE NY AN
ODD NUMBER AND
N1,N2,N3, COUNTERS
FOR PATCH ARRAY
      I            02
*--------------------*
I       NY = 7       I
I       N1 = 0       I
I       N2 = 0       I
I       N3 = 0       I
*--------------------*
      I
** DETERMINE PFACT,
A FACTOR TO CONVERT
F.D. PATCH LENGTHS TO
AREA IN
      I            03
*--------------------*
I  PFACT = WIDTH/9   I
*--------------------*
      I
** TEST FOR PAVEMENT
TYPE
      I
      *   04
TRUE  *
+-----* ITYPE .EQ. 1  *
I     IFALSE
I     I
I  ** IF THE PAVEMENT
I  IS BITUMINOUS THE
I  ARRAY IS FACTORED BY
I  TEN AND
I     I             05
I  *--------------------*
I  I PFACT = PFACT*10  I
I  *--------------------*
I     I
+--------->I
  106     I  NOTE  06
* * * * * * * * * * *
*     CONTINUE      *
* * * * * * * * * * *
      I
** TWO RANDOM
NUMBERS ARE GENERATED
FOR TESTING AGAINST
DISTRIBUTION
      I
      +------------------>*
```

```
      I  NOTE  08
* * * * * * * * * * *
*   BEGIN DO LOOP   *
*   110 I1 = 1, 10  *
* * * * * * * * * * *
      I
18.05--->I
      *   09
 * N1 .EQ.   *  TRUE
* 1000 .AND. N2 *-+
 * .EQ. 1000 *    I
      IFALSE   . 18 .
      I        . 06 .
      I         111
      I  NOTE  10
* * * * * * * * * * *
*   BEGIN DO LOOP   *
*  101 I = 1, 1000  *
* * * * * * * * * * *
      I
18.04--->I
      I  NOTE  11
* * * * * * * * * * *
*   BEGIN DO LOOP   *
*   104 J = 1, 2    *
* * * * * * * * * * *
      I
      I<-----------------+
      I            12    I
*--------------------*   I
I   NY = NY*65539    I   I
*--------------------*   I
      I                  I
      *   13             I
(0/+) *                  I
+-----*     NY      *    I
I                        I
I     I (-)              I
I 102 I            14    I
I *--------------------* I
I I   NY = NY +        I I
I I  2147483647 + 1    I I
I *--------------------* I
I     I                  I
+--------->I             I
 104  I            15    I
*--------------------*   I
I   RANDOM(J) =      I   I
I  NY*.4656613E-9    I   I
*--------------------*   I
      I                  I
      *   16             I
      *             * NO I
*  END OF DO  *----------+
 *   LOOP?   *
      IYES
      I
      +------------------->*
```

```
      I
** THE FIRST RANDOM
NUMBER IS CONVERTED
TO A FULL DEPTH
CONCRETE
** PATCH LENGTH AND
TO A PARTIAL DEPTH
PATCH AREA
      I            17
*--------------------*
I XF = RANDOM(1)*50  I
I                    I
I XP = RANDOM(1)*40  I
*--------------------*
      I
** ONCE ANY COUNTER
REACHES 1000 THE
ARRAY HAS BEEN FILLED
      I
      *   18
      *             *  TRUE I
* N1 .EQ. 1000   *------+
      *                 A
      IFALSE
      I
** THE FULL DEPTH
PATCH LENGTH IS
ASSIGNED TO THE
DENSITY FUNCTION
** FOR FULL DEPTH
PATCH SIZES AND THE
RESULTING NUMBER IS
TESTED
** AGAINST THE
SECOND RANDOM NUMBER
      I            19
*--------------------*
I      YO =          I
I   (.186E-3)        I
I  *((.75*XF)**8)    I
I  *(EXP(-.75*XF))   I
*--------------------*
      I
      *   20
      *             *  TRUE I
*  RANDOM(2)    *-------+
 * .GT. YO  *
      IFALSE
      I
** THE ACCEPTED
PATCH IS PLACED IN AN
ARRAY
      I            21
*--------------------*
I     N1 = N1 + 1    I
I                    I
I   PATCHF(N1) =     I
I     XF*PFACT       I
*--------------------*
      I
      +------------------------>*
```

```
      I
** ONCE ANY COUNTER
REACHES 1000 THE
ARRAY HAS BEEN FILLED
      I
+-----I----17.18*-->I
      I
  103  *   22
      *             *  TRUE
* N2 .EQ. 1000   *-+
      IFALSE   . 18 .
      I        . 02 .
      I         108
      I
** THE PARTIAL DEPTH
PATCH AREA IS
ASSIGNED TO THE
DENSITY FUNCTION
** FOR PARTIAL DEPTH
PATCH SIZES AND THE
RESULTING NUMBER IS
TESTED
** AGAINST THE
SECOND RANDOM NUMBER
      I            23
*--------------------*
I      YO =          I
I 1.47*XP*EXP(-.6*   I
I     XP) + .1       I
*--------------------*
      I
      *   24
      *             *  TRUE
*  RANDOM(2)    *-+
 * .GT. YO  *     I
      IFALSE   . 18 .
      I        . 02 .
      I         108
      I
** PARTIAL DEPTH
PATCH CANNOT BE
SMALLER THAN 1/2 SQ.
FT.
      I
      *   25
      *             *  TRUE
*  XP .LT. 0.5  *-+.
      IFALSE   . 18 .
      I        . 02 .
      I         108
      I
** THE ACCEPTED
PATCH IS PLACED IN AN
ARRAY
      I
      I  /
   -----
  /18.01
```

```
17.26--->*
          I            01
*--------------------*
I    N2 = N2 + 1     I
I                    I
I  PATCHP(N2) = XP   I
*--------------------*

** ONCE ANY COUNTER
REACHES 1000 THE
ARRAY HAS BEEN FILLED

17.22*-->I
 108      *   02
TRUE *  N3 .EQ. 1000  *
          IFALSE

** THE SECOND RANDOM
NUMBER IS ASSIGNED TO
A RANDOM NUMBER ARRAY
                       03
*--------------------*
I    N3 = N3 + 1     I
I                    I
I    RLOC(N3) =      I
I     RANDOM(2)      I
*--------------------*

 101      *   04
*   END OF DO    *-+ NO
*   LOOP?     *
          IYES   . 17 .
                 . 11 .

 110      *   05
*   END OF DO    *-+ NO
*   LOOP?     *
          IYES   . 17 .
                 . 09 .

17.09--->I
 111      I  NOTE  06
* * * * * * * * * * *
*     CONTINUE      *
* * * * * * * * * * *

** THE RANDOM NUMBER
ARRAY IS SORTED IN
ASCENDING ORDER
```

```
                   I  NOTE  08
* * * * * * * * * * *
*   BEGIN DO LOOP   *
*  105 I = 1, 999   *
* * * * * * * * * * *
18.14--->I
         I          09
*--------------------*
I     N = I + 1      I
*--------------------*
         I  NOTE  10
* * * * * * * * * * *
*   BEGIN DO LOOP   *
*  107 J = N, 1000  *
* * * * * * * * * * *
         I<-------------+
         *   11
TRUE *  RLOC(J) .GT.  *
      *  RLOC(I)  *
         IFALSE
                     12
*--------------------*
I  TEMP1 = RLOC(I)   I
I                    I
I RLOC(I) = RLOC(J)  I
I                    I
I  RLOC(J) = TEMP1   I
*--------------------*

 107      *   13
*   END OF DO    *------+ NO
*   LOOP?     *
          IYES

 105      *   14
*   END OF DO    *-+ NO
*   LOOP?     *
          IYES   . 18 .
                 . 09 .

***COMPUTE THE
SIMULATION WORKLOAD
TO BE ASSOCIATED WITH
EACH ACTIVIT
         I  NOTE  15
* * * * * * * * * * *
*   BEGIN DO LOOP   *
*  120 IA = 1, 7    *
* * * * * * * * * * *
```

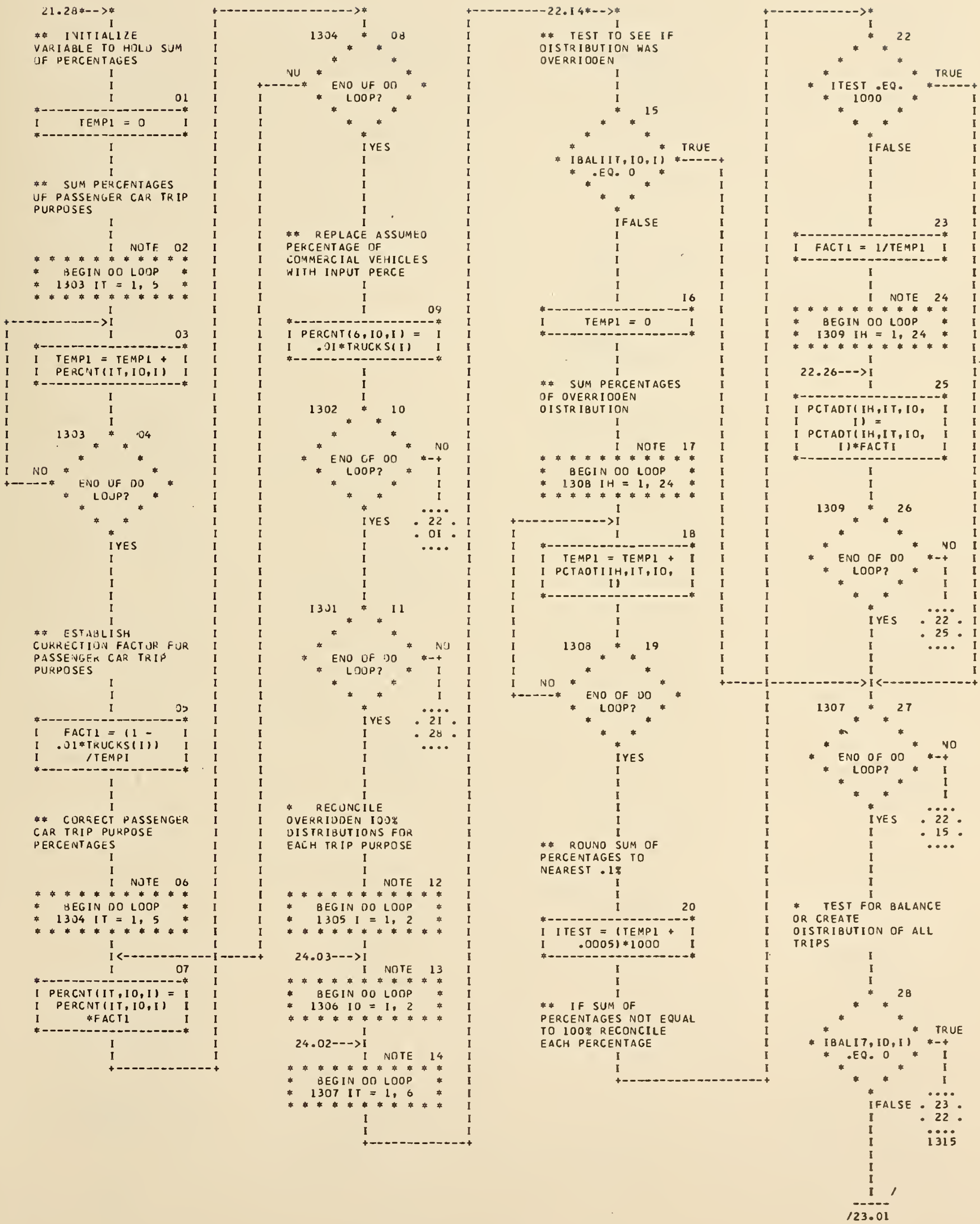
```
+----18.15*-->*
       ***DETERMINE THE
       TYPE OF WORKSITE,FULL
       DEPTH, PARTIAL DEPTH,
       LANE
                     16
*--------------------*
I   J = SIM(IA,1)    I
*--------------------*

***DETERMINE THE
NUMBER OF ITERATIONS
                     17
*--------------------*
I   N = SIM(IA,4)    I
*--------------------*

***INITIALIZE THE
HOLD FOR THE
SIMULATION WORKLOAD
                     18
*--------------------*
I   SWORK(IA) = 0    I
*--------------------*
          I  NOTE  19
* * * * * * * * * * *
*   BEGIN DO LOOP   *
*   121 IW = 1, N   *
* * * * * * * * * * *
19.02--->I
         I          20
*--------------------*
I  COMPUTED GO TO    I
I      FOR J         I
*--------------------*
I 130        18.21   I
I 131        18.22   I
I 132        18.23   I
*--------------------*

IF OUTSIDE THE RANGE
18.20--->I
 130     I          21
*--------------------*
I     TEMP1 =        I
I    PATCHF(IW)      I
*--------------------*
          .19.01.
          ... 133
```

```
/   131    /
18.20--->I
         I          22
*--------------------*
I     TEMP1 =        I
I    PATCHP(IW)      I
*--------------------*
      .19.01.
      ... 133

/   132    /
18.20--->I
         I          23
*--------------------*
I    SWORK(IA) =     I
I   (SIM(IA,2) +     I
I   SIM(IA,3))*N     I
*--------------------*
      .19.03.
      ... 120
```

```
                                                                                                   -----------
                                                                                                  /   561    /
                                                                                                  -----------
                                                                                                       I
                                                                                            19.09--->I
                                                                                                       I          11
 ***ACCUMULATE                                                                              *--------------------*
SIMULATION WORKLOAD                                                                         I     CPLANE =       I
                                                                                            I     DETOUR(5)      I
 18.21*-->*                                                                                 I    /DETOUR(7)      I
   133    I          01                                                                     *--------------------*
*--------------------*                                                                                 I
I    SWORK(IA) =     I                                                                                 I
I    SWORK(IA) +     I                                                                                 I
I TEMP1*SIM(IA,2) +  I                                                                                ...
I     SIM(IA,3)      I                                                                               .   .
*--------------------*                                                                               .20.02.
          I                                                                                          .   .
          I                                                                                           ... 563
          I
  121     *    02
        *   *
      *       *
    *           *    NO
  *   END OF DO   *-+
    *   LOOP?   *   I
      *       *     I
        *   *       I
          *       ....
          IYES   . 18 .
          I      . 20 .
          I       ....
          I
          I
 18.23--->I
          I
  120     *    03
        *   *
      *       *
    *           *    NO
  *   END OF DO   *-+
    *   LOOP?   *   I
      *       *     I
        *   *       I
          *       ....
          IYES   . 18 .
          I      . 16 .
          I       ....
          I
          I
          I
          I
SUBROUTINE SPEED
          I
          I
          I
 ***DETERMINATION OF
SPEED MATRICS            +------------------->*
          I              I                    I
          I              I     ***DO FOR EACH SPEED
          I              I    CATEGORY
 ***DETERMINE MAXIMUM    I                    I
AVERAGE OPERATING        I                    I
SPEED FOR FREEWAY        I                    I  NOTE  07
          I              I    * * * * * * * * * * *
          I              I    *    BEGIN DO LOOP    *
          I         04   I    *    550 IC = 1, N    *
*--------------------*   I    * * * * * * * * * * *
I      TEMP1 =       I   I                    I
I    0.9*DSPEED      I   I     20.17--->I
*--------------------*   I                    I
          I              I     ***HOW MANY LANES
          I              I    OPEN TO THE MOTOREST
          I              I                    I
 ***ESTABLISH THE        I                    I
NUMBER OF SPEED          I                    I          08
CATEGORIES               I    *--------------------*
          I              I    I  M = LANES - IC    I
          I              I    *--------------------*
          I         05   I                    I
*--------------------*   I                    I
I   N = LANES + 1    I   I                    I
*--------------------*   I     ***MINUS IS FREEWAY,
          I              I    ZERO IS DETOUR
          I              I                    I
          I              I                    I
 ***DETERMINE SPEED      I                    I
LIMIT ON DETOUR          I                    *    09
          I              I                  *   *
          I              I                *       *
          I         06   I    (0) *                 *   (-)
*--------------------*   I    +-*           M         *------+         ***LANE CAPACITY
I  SLIMIT(LANES) =   I   I    I   *                 *        I        COMPUTATIONS
I     DETOUR(3)      I   I    I     *             *          I
*--------------------*   I    I       *   *                  +------------------->*
          I              I   ....           *                       560    I          10
          I              I  . 19 .          I (+)                 *--------------------*
          +--------------+  . 11 .          I                     I     CPLANE =       I
                             ....           I                     I   CAP(IC)/LANES    I
                             561            I                     *--------------------*
                                            I                                  I
                                            I                                  I
                                            I                                  I
                                           ...                                ...
                                          .   .                              .   .
                                          .20.01.                            .20.02.
                                          .   .                              .   .
                                           ... 562                            ... 563
```

```
/ 562 /
19.09--->I
01  CPLANE = CAP(IC)/M
19.10*-->I
563  NOTE 02
  CONTINUE
***COMPUTE SPEED AT CAPACITY
03  TEMP2 = 12.0*CPLANE + .5*CPLANE**4.46
***DETERMINE MAXIMUM SPEED LOSS
04  TEMP3 = TEMP1 - TEMP2
***DO FOR ELEVEN INCREMENTS OF THE VOLUME-CAPACITY RATIO
NOTE 05  BEGIN DO LOOP 551 I = 1, 11
20.16--->I
***DETERMINE A VOLUME
06  FACT2 = (I - 1)*CPLANE/10.
    VC = FACT2/CPLANE
***ESTABLISH CONSTANT SPEED LOSS
07  TEMP4 = (.4*FACT2 - 10)*VC
***DETERMINE TOTAL AVAILABLE SPEED LUSS TU CAPACITY SPEED
08  TEMP5 = TEMP3 - TEMP4

09  TEMP5 .LT. 0   FALSE / TRUE
10  TEMP5 = 0
***DETERMINE SPEED LOSS TU CAPACITY SPEED
11  TEMP6 = VC**25*TEMP5
***COMPUTE AND HOLD SPEED
12  SP(IC,I) = TEMP1 - TEMP4 - TEMP6
***DETERMINE SPEED FOR SPEED LIMIT
13  TEMP7 = SLIMIT(IC)*.9 - 3.6*VC
***TEST FOR MINIMUM SPEED AND HOLD MIMIMUM
14  SP(IC,I) .GT. TEMP7   FALSE / TRUE
15  SP(IC,I) = TEMP7

20.14*-->*
551  16  END OF DO LOOP?   NO . 20 . 06 .   YES
550  17  END OF DO LOOP?   NO . 19 . 08 .   YES
SUBROUTINE INOCC
** CREATION OF THE IHOUR ARRAY FOR OCCUPANCY TIME
** CREATE A OCCUPANCY ARRAY FOR EACH ACTIVITY
NOTE 18  BEGIN DO LOOP 1342 IA = 1, 7
21.25--->I
** ZERO INDEX SO DEFAULT OCCURS IF ACTIVITY IS NOT IDENTIFIED
19  INDEX = 0
***IF THE CREWHOUR VARIABLE 'OVER(1,IA)' IS EQUAL TO 24
***THEN ASSIGN 1'S TO THE IHOUR ARRAY FOR ACTIVIY IA
20  OVER(1,IA) .EQ. 24   FALSE / TRUE

21  INDEX = I
NOTE 22  BEGIN DO LOOP 1341 IH = 1, 24
23  IHOUR(IH,IA) = INDEX
1341  24  END OF DO LOOP?   NO / YES
25  INDEX .EQ. 1   TRUE . 21 . 25 . 1342   FALSE
** SEARCH FOR A MATCH TO ACTIVITY NUMBER
NOTE 26  BEGIN DO LOOP 1343 I = 1, 10
21.10--->I
27  INOCC(I,I) .NE. IA   TRUE . 21 . 10 . 1343   FALSE
** ESTABLISH A "FROM", "TO" OCCUPANCY RANGE
28  IN1 = INOCC(I,2)
    IN2 = INOCC(I,3)
/21.01
```

```
20.28--->*
         I
** THE "FROM"
OCCUPANCY HOUR CANNOT
EXCEED THE "TO"
OCCUPANCY HOUR
         I
         *   01
FALSE *              *
+-----* IN1 .GT. IN2 *
I        *
I        ITRUE
I        I               02
I  *-------------------*
I  I  IN2 = IN2 + 24   I
I  *-------------------*
+------------>I
** SET INDEX TO
EQUAL 1 SO THE
DEFAULT ROUTINE IS
BYPASSED
         I               03
   *-------------------*
   I    INDEX = 1      I
   *-------------------*
** ASSIGN 1 TO IHOUR
FOR EACH HOUR WHEN
ROAD CAN BE OCCUPIED
         I  NOTE  04
* * * * * * * * * * *
*   BEGIN DO LOOP   *
* 1345 J = IN1, IN2 *
* * * * * * * * * * *
         I<------------I-----+
         I               05
   *-------------------*
   I      J1 = J       I
   *-------------------*
** THE IHOUR ARRAY
CAN NOT EXCEED 24
         *   06
FALSE *              *
+-----* J1 .GT. 24   *
I        *
I        ITRUE
I        I               07
I  *-------------------*
I  I   J1 = J1 - 24    I
I  *-------------------*
+------------>I
  1345       I           08
   *-------------------*
   I IHOUR(J1,IA) = 1  I
   *-------------------*
         I
         +-------------+


+------------------->*
                     *   09
NO  *                    *
+-----* END OF DO        *
I       *  LOOP?     *
I              *
I              IYES
I 20.27--->I
I  1343    *   IO
I  *                  *  NO
I  *   END OF DO      *--+
I     *  LOOP?     *     I
I          *           ....
I          IYES     . 20 .
I          I        . 27 .
I          I         ....
I  1344    *   11
I  *                  *  TRUE
I  * INDEX .EQ. 1     *--+
I          *           ....
I          IFALSE   . 21 .
I          I        . 24 .
I          I         ....
I          I         1349
I ** DEFAULT OPTION
I FOR WHEN NO ACTIVITY
I HAS BEEN IDENTIFIED
I ** SEARCH FOR A
I MATCH TO ACTIVITY
I NUMBER TEN
           I  NOTE  12
  * * * * * * * * * * *
  *   BEGIN DO LOOP   *
  *  1346 I = 1, 10   *
  * * * * * * * * * * *
  21.23--->I
           *   13
  *                  *  TRUE
  *  INOCC(I,1)      *--+
     *  .NE. 10   *     I
           *           ....
           IFALSE   . 21 .
           I        . 23 .
           I         ....
           I         1346
  * ESTABLISH A
  "FROM", "TO"
  OCCUPANCY RANGE
           I             14
  *-------------------*
  I IN1 = INOCC(I,2)  I
  I                   I
  I IN2 = INOCC(I,3)  I
  *-------------------*
           I
           +-------------+


+------------------->*
         I
** THE "FROM"
OCCUPANCY HOUR CANNOT
EXCEED THE "TO"
OCCUPANCY HOUR
         I
         *   15
FALSE *              *
+-----* IN1 .GT. IN2 *
I        *
I        ITRUE
I        I               16
I  *-------------------*
I  I  IN2 = IN2 + 24   I
I  *-------------------*
+------------>I
         I  NOTE  17
* * * * * * * * * * *
*   BEGIN DO LOOP   *
* 1347 J = IN1, IN2 *
* * * * * * * * * * *
         I<------------I-----+
         I               18
   *-------------------*
   I      J1 = J       I
   *-------------------*
** THE IHOUR ARRAY
CANNOT EXCEED 24
         *   19
FALSE *              *
+-----* J1 .GT. 24   *
I        *
I        ITRUE
I        I               20
I  *-------------------*
I  I   J1 = J1 - 24    I
I  *-------------------*
+------------>I
** ASSIGN 1 TO IHOUR
FOR EACH HOUR WHEN
ROAD CAN BE OCCUPIED
  1347   I               21
   *-------------------*
   I IHOUR(J1,IA) = 1  I
   *-------------------*
         I
         +-------------+


+------------------->*
                     *   22
NO  *                    *
+-----* END OF DO        *
I       *  LOOP?     *
I              *
I              IYES
I 21.13--->I
I  1346    *   23
I  *                  *  NO
I  *   END OF DO      *--+
I     *  LOOP?     *     I
I          *           ....
I          IYES     . 21 .
I          I        . 13 .
I          I         ....
I 21.11--->I
I  1349    I  NOTE  24
* * * * * * * * * * *
*     CONTINUE      *
* * * * * * * * * * *
  20.25--->I
   1342    *   25
  *                  *  NO
  *   END OF DO      *--+
     *  LOOP?     *     I
           *           ....
           IYES     . 20 .
           I        . 19 .
           I         ....
SUBROUTINE RECON
           I
   1300    I  NOTE  26
* * * * * * * * * * *
*     CONTINUE      *
* * * * * * * * * * *
** BALANCE
DISTRIBUTION OF TRIP
PURPOSES TO REFLECT
INPUT % COM.VEH.
** FOR INITIAL AND
FINAL YEAR
           I  NOTE  27
* * * * * * * * * * *
*   BEGIN DO LOOP   *
*   1301 I = 1, 2   *
* * * * * * * * * * *
  22.11--->I
** FOR AM AND PM
PEAK DIRECTIONS
           I  NOTE  28
* * * * * * * * * * *
*   BEGIN DO LOOP   *
*  1302 ID = 1, 2   *
* * * * * * * * * * *
           I /
         -----
        /22.01
```


21.28*-->*
** INITIALIZE VARIABLE TO HOLD SUM OF PERCENTAGES
01
TEMP1 = 0
** SUM PERCENTAGES OF PASSENGER CAR TRIP PURPOSES
NOTE 02
BEGIN DO LOOP 1303 IT = 1, 5
03
TEMP1 = TEMP1 + PERCNT(IT,IO,I)
1303 04
END OF DO LOOP?
NO
YES
** ESTABLISH CORRECTION FACTOR FOR PASSENGER CAR TRIP PURPOSES
05
FACT1 = (1 - .01*TRUCKS(I)) /TEMP1
** CORRECT PASSENGER CAR TRIP PURPOSE PERCENTAGES
NOTE 06
BEGIN DO LOOP 1304 IT = 1, 5
07
PERCNT(IT,IO,I) = PERCNT(IT,IO,I) *FACT1
1304 08
END OF DO LOOP?
NO
YES
** REPLACE ASSUMED PERCENTAGE OF COMMERCIAL VEHICLES WITH INPUT PERCE
09
PERCNT(6,IO,I) = .01*TRUCKS(I)
1302 10
END OF DO LOOP?
NO
YES
. 22 .
. 01 .
1301 11
END OF DO LOOP?
NO
YES
. 21 .
. 28 .
* RECONCILE OVERRIDDEN 100% DISTRIBUTIONS FOR EACH TRIP PURPOSE
NOTE 12
BEGIN DO LOOP 1305 I = 1, 2
24.03--->
NOTE 13
BEGIN DO LOOP 1306 IO = 1, 2
24.02--->
NOTE 14
BEGIN DO LOOP 1307 IT = 1, 6
22.14*-->*
** TEST TO SEE IF DISTRIBUTION WAS OVERRIDDEN
15
IBAL(IT,IO,I) .EQ. 0
TRUE
FALSE
16
TEMP1 = 0
** SUM PERCENTAGES OF OVERRIDDEN DISTRIBUTION
NOTE 17
BEGIN DO LOOP 1308 IH = 1, 24
18
TEMP1 = TEMP1 + PCTADT(IH,IT,IO, I)
1308 19
END OF DO LOOP?
NO
YES
** ROUND SUM OF PERCENTAGES TO NEAREST .1%
20
ITEST = (TEMP1 + .0005)*1000
** IF SUM OF PERCENTAGES NOT EQUAL TO 100% RECONCILE EACH PERCENTAGE
22
ITEST .EQ. 1000
TRUE
FALSE
23
FACT1 = 1/TEMP1
NOTE 24
BEGIN DO LOOP 1309 IH = 1, 24
22.26--->
25
PCTADT(IH,IT,IO, I) = PCTADT(IH,IT,IO, I)*FACT1
1309 26
END OF DO LOOP?
NO
YES
. 22 .
. 25 .
1307 27
END OF DO LOOP?
NO
YES
. 22 .
. 15 .
* TEST FOR BALANCE OR CREATE DISTRIBUTION OF ALL TRIPS
28
IBAL(7,IO,I) .EQ. 0
TRUE
FALSE
. 23 .
. 22 .
1315
/23.01

```
22.28--->*
         I
*   BALANCE ALL TRIPS
DISTRIBUTION
         I
         I
         I                D1
*--------------------*
I      TEMP1 = 0     I
*--------------------*
         I
         I
         I
**  SUM PERCENTAGES
         I
         I
         I  NOTE  D2
* * * * * * * * * * *
*   BEGIN DO LOOP   *
*  1310 IH = 1, 24  *
* * * * * * * * * * *
         I
+------------>I
I        I                D3
I  *--------------------*
I  I  TEMP1 = TEMP1 +  I
I  I  PCTADT(IH,7,ID,I) I
I  *--------------------*
I        I
I        I
I        I
I  1310  *   04
I       *  *
I     *      *
I  NO *        *
+-----*  END OF DO  *
        *  LOOP?  *
          *     *
            * *
             *
             IYES
             I
             I
             I
             I
             I
             I
**  ROUND SUM OF
PERCENTAGES TO
NEAREST .1%
         I
         I
         I                05
*--------------------*
I ITEST = (TEMP1 +   I
I    .0005)*1000     I
*--------------------*
         I
         I
         I
**  IF SUM OF
PERCENTAGES NOT EQUAL
TO 100 RECONCILE EACH
PERCENTAGE
         I
         I
         I
         *   06
       *   *
     *       *     TRUE I
  *  ITEST .EQ.   *-----+
     *   1000   *
       *      *
         *  *
          *
          IFALSE
          I
          I
          I
          I
          I               07
*--------------------*
I  FACT1 = 1/TEMP1   I
*--------------------*
         I
         I
         I  NOTE  08
* * * * * * * * * * *
*   BEGIN DO LOOP   *
*  1311 IH = 1, 24  *
* * * * * * * * * * *
         I
         I
         +--------------------+
```

```
+----23.08*-->*
I             I              09
I  *--------------------*
I  I PCTADT(IH,7,ID,I)  I
I  I        =           I
I  I PCTADT(IH,7,ID,I)  I
I  I       *FACT1       I
I  *--------------------*
I             I
+-----I------------->I
I     I              I
I     I    1311   *   10
I     I          *  *
I     I        *      *
I     I  NO  *          *
I     I<----*   END OF DO   *
I     I       *   LOOP?   *
I     I         *       *
I     I           *   *
I     I             *
I     I             IYES
I     I             I
I     I             I
I     I             I
I     I             I
I     I             I  NOTE  11
I     I  * * * * * * * * * * *
I     I  *   BEGIN DO LOOP   *
I     I  *  1312 IH = 1, 24  *
I     I  * * * * * * * * * * *
I     I             I
I     I  23.21--->I
I     I             I              12
I     I  *--------------------*
I     I  I     TEMP1 = 0      I
I     I  *--------------------*
I     I             I
I     I             I
I     I             I  NOTE  13
I     I  * * * * * * * * * * *
I     I  *   BEGIN DO LOOP   *
I     I  *  1313 IT = 1, 6   *
I     I  * * * * * * * * * * *
I     I             I
I     I             I<-------------+
I     I             I              I
I     I  **  ADJUST 100%           I
I     I  DISTRIBUTIONS BY          I
I     I  DISTRIBUTION OF TRIP      I
I     I  PURPOSES                  I
I     I             I              I
I     I             I              I
I     I             I        14    I
I     I  *--------------------*    I
I     I  I PCTADT(IH,IT,IU,   I    I
I     I  I       I) =         I    I
I     I  I PCTADT(IH,IT,ID,   I    I
I     I  I I)*PERCNT(IT,ID,   I    I
I     I  I       I)           I    I
I     I  *--------------------*    I
I     I             I              I
I     I             I              I
I     I             I              I
I     I  **  SUM PERCENTAGES       I
I     I  OF INDIVIDUAL TRIP        I
I     I  PURPOSES                  I
I     I             I              I
I     I             I              I
I     I             I        15    I
I     I  *--------------------*    I
I     I  I TEMP1 = TEMP1 +    I    I
I     I  I PCTADT(IH,IT,ID,   I    I
I     I  I       I)           I    I
I     I  *--------------------*    I
I     I             I              I
I     I             I              I
I     I             I              I
I     I  1313    *   16            I
I     I        *  *                I
I     I      *      *              I
I     I    *          *     NO     I
I     I  *   END OF DO   *-----+
I     I    *   LOOP?   *
I     I      *       *
I     I        *   *
I     I          *
I     I          IYES
I     I          I
I     I          I
I     I          I
I     I          I
I     I          +--------------------+
I     I
+-----+
```

```
+------------->*
I              I              17
I  *--------------------*
I  I      FACT1 =       I
I  I PCTADT(IH,7,ID,I)  I
I  I      /TEMP1        I
I  *--------------------*
I              I
I              I
I              I
I  **  BALANCE
I  INDIVIDUAL TRIP
I  PURPOSES DISTRIBUTION
I  TO DISTRIBUTION OF A
I              I
I              I
I              I  NOTE  18
I  * * * * * * * * * * *
I  *   BEGIN DO LOOP   *
I  *  1314 IT = 1, 6   *
I  * * * * * * * * * * *
I              I
I              I<-------------+
I              I         19   I
I  *--------------------*    I
I  I PCTADT(IH,IT,ID,   I    I
I  I       I) =         I    I
I  I PCTADT(IH,IT,ID,   I    I
I  I     I)*FACT1       I    I
I  *--------------------*    I
I              I              I
I              I              I
I              I              I
I   1314    *   20            I
I         *  *                I
I       *      *              I
I     *          *     NO     I
I   *   END OF DO   *-----+
I     *   LOOP?   *
I       *       *
I         *   *
I           *
I           IYES
I           I
I           I
I           I
I           I
I           I
I           I
I   1312    *   21
I         *  *
I       *      *
I     *          *     NO
I   *   END OF DO   *--+
I     *   LOOP?   *    I
I       *       *      I
I         *   *        I
I           *        ....
I           IYES    . 23 .
I           I       . 12 .
I           I        ....
I           I
I           I
I           I
I           I
I           I
           ...
          .    .
          .24.02.
          .    .
           ... 1306
```

```
*   CREATE
DISTRIBUTION OF ALL
TRIPS

 22.28--->*
 1315    I   NOTE  22
* * * * * * * * * * *
*     CONTINUE      *
* * * * * * * * * * *
         I
         I
         I  NOTE  23
* * * * * * * * * * *
*   BEGIN DO LOOP   *
*  1316 IH = 1, 24  *
* * * * * * * * * * *
         I
 24.01--->I
         I                24
*--------------------*
I      TEMP1 = 0     I
*--------------------*
         I
         I
         I  NOTE  25
* * * * * * * * * * *
*   BEGIN DO LOOP   *
*  1317 IT = 1, 6   *
* * * * * * * * * * *
         I
+------------>I
I        I
I  **  ADJUST
I  100%DISTRIBUTIONS BY
I  DISTRIBUTION OF TRIP
I  PURPOSES
I        I
I        I
I        I                26
I  *--------------------*
I  I PCTADT(IH,IT,ID,   I
I  I       I) =         I
I  I PCTADT(IH,IT,ID,   I
I  I I)*PERCNT(IT,ID,   I
I  I       I)           I
I  *--------------------*
I        I
I        I
I        I
I  **  SUM PERCENTAGES
I  OF INDIVIDUAL TRIP
I  PURPOSES
I        I
I        I
I        I                27
I  *--------------------*
I  I TEMP1 = TEMP1 +    I
I  I PCTADT(IH,IT,ID,   I
I  I       I)           I
I  *--------------------*
I        I
I        I
I   1317  *   28
I       *  *
I     *      *
I  NO *        *
+-----*  END OF DO  *
        *  LOOP?  *
          *     *
            * *
             *
             IYES
             I
             I
             I
             I
             I
**  PERCENTAGE OF ALL
TRIPS EQUALS SUM OF
INDIVIDUAL TRIP
PUTPOSES
         I
         I
         I                29
*--------------------*
I PCTADT(IH,7,ID,I)  I
I      = TEMP1       I
*--------------------*
         I
         I
         I
         I  /
       -----
      /24.01
```

```
23.29--->*
  1316  *  01
  * END OF DO LOOP? *  NO  *-+
  IYES  . 23 .
        . 24 .
23.21--->I
  1306  *  02
  * END OF DO LOOP? *  NO  *-+
  IYES  . 22 .
        . 14 .
  1305  *  03
  * END OF DO LOOP? *  NO  *-+
  IYES  . 22 .
        . 13 .
*   TEST FOR AVERAGE
MORNING AND EVENING
PEAKS
        *  04
  * IDIR .NE. 3 *  TRUE  *------+
  IFALSE
        I  NOTE  05
* * * * * * * * * * *
*  BEGIN DO LOOP    *
*  1318 I = 1, 2    *
* * * * * * * * * * *
24.11--->I
        I  NOTE  06
* * * * * * * * * * *
*  BEGIN DO LOOP    *
*  1319 IT = 1, 7   *
* * * * * * * * * * *
24.10--->I
        I  NOTE  07
* * * * * * * * * * *
*  BEGIN DO LOOP    *
*  1320 IH = 1, 24  *
* * * * * * * * * * *
        +-------------------+

+----24.07*-->*
**  AVERAGE MORNING
AND EVENING PEAKS
                        08
*-------------------*
I PCTADT(IH,IT,1,I) I
I        =          I
I (PCTADT(IH,IT,1,  I
I        I) +       I
I PCTADT(IH,IT,2,I) I
I        )/2        I
I                   I
I PCTADT(IH,IT,2,I) I
I        =          I
I PCTADT(IH,IT,1,I) I
*-------------------*
  1320  *  09
  NO  *  
I<----*  END OF DO LOOP?  *
  IYES
  1319  *  10
  * END OF DO LOOP? *  NO  *-+
  IYES  . 24 .
        . 07 .
  1318  *  11
  * END OF DO LOOP? *  NO  *-+
  IYES  . 24 .
        . 06 .
+-----I------------->I
  1331  I  NOTE  12
* * * * * * * * * * *
*    CONTINUE       *
* * * * * * * * * * *
*  CONVERT DAILY
DISTRIBUTION OF TRIP
PURPOSES TO HOURLY
DISTRIBUTION
**  INITIAL AND FINAL
YEAR
        I  NOTE  13
* * * * * * * * * * *
*  BEGIN DO LOOP    *
*  1321 I = 1, 2    *
* * * * * * * * * * *
        +-------------+

+----------24.13*-->*
**  A.M. AND P.M.
PEAK DIRECTIONS
        I  NOTE  14
* * * * * * * * * * *
*  BEGIN DO LOOP    *
*  1322 ID = 1, 2   *
* * * * * * * * * * *
        I<------------+
**  EACH HOUR OF THE
DAY
        I  NOTE  15
* * * * * * * * * * *
*  BEGIN DO LOOP    *
*  1323 IH = 1, 24  *
* * * * * * * * * * *
        I<------------+
**  ESTABLISH DAILY
TO HOURLY CONVERSION
FACTOR
        I            16
*-------------------*
I     FACT1 =       I
I 1/PCTADT(IH,7,ID, I
I        I)         I
*-------------------*
**  EACH TRIP PURPOSE
        I  NOTE  17
* * * * * * * * * * *
*  BEGIN DO LOOP    *
*  1324 IT = 1, 6   *
* * * * * * * * * * *
+------------->I
        I            18
*-------------------*
I PCTADT(IH,IT,ID,  I
I        I) =       I
I PCTADT(IH,IT,ID,  I
I      I)*FACT1     I
*-------------------*
  1324  *  19
  NO  *
+-----*  END OF DO LOOP?  *
  IYES
  1323  *  20
  * END OF DO LOOP? *  NO  *-----+
  IYES
        +-------------------+

+------------>*
  1322  *  21
  NO  *
+-----I-----*  END OF DO LOOP?  *
  IYES
  1321  *  22
  * END OF DO LOOP? *  NO  *-+
  IYES  . 24 .
        . 14 .
*   CREATE BASE YEAR
AND YEARLY INCREMENT
ARRAYS
        I            23
*-------------------*
I NYEARS = NYEARS - I
I        I          I
*-------------------*
        I  NOTE  24
* * * * * * * * * * *
*  BEGIN DO LOOP    *
*  1328 ID = 1, 2   *
* * * * * * * * * * *
25.04--->I
        I  NOTE  25
* * * * * * * * * * *
*  BEGIN DO LOOP    *
*  1329 IT = 1, 7   *
* * * * * * * * * * *
25.03--->I
        I  NOTE  26
* * * * * * * * * * *
*  BEGIN DO LOOP    *
*  1330 IH = 1, 24  *
* * * * * * * * * * *
25.02--->I
**  COMPUTE YEARLY
INCREMENT
        I            27
*-------------------*
I PCTADT(IH,IT,ID,  I
I        2) =       I
I (PCTADT(IH,IT,ID, I
I        2) -       I
I PCTADT(IH,IT,ID,  I
I    I))/NYEARS     I
*-------------------*
**  COMPUTE BASE YEAR
DISTRIBUTIONS
        I /
      -----
     /25.01
```

```
 24.28--->*
          I          01
*-------------------*
I PCTADT(IH,IT,IO,  I
I       1) =        I
I PCTADT(IH,IT,IO,  I
I       1) -        I
I PCTADT(IH,IT,IO,  I
I       2)          I
*-------------------*
          I
          I
          I
   1330   *    02
        *   *
      *       *
    *           *    NO
  *   END OF DO   *-+
    *   LOOP?   *   I
      *       *     I
        *   *       I
          *        ....
          IYES    . 24 .
          I       . 27 .
          I        ....
          I
          I
          I
          I
   1329   *    03
        *   *
      *       *
    *           *    NO
  *   END OF DO   *-+
    *   LOOP?   *   I
      *       *     I
        *   *       I
          *        ....
          IYES    . 24 .
          I       . 26 .
          I        ....
          I
          I
          I
          I
   1328   *    04
        *   *
      *       *
    *           *    NO
  *   END OF DO   *-+
    *   LOOP?   *   I
      *       *     I
        *   *       I
          *        ....
          IYES    . 24 .
          I       . 25 .
          I        ....
          I
          I
          I
          I
**  CONVERT INITIAL
AND FINAL VOLUME TO
BASE YEAR AND YEARLY
INCREMENT
          I
          I
          I          05
*-------------------*    +------------------>*
I    VOLUME(2) =    I    I                   I          07
I   (VOLUME(2) -    I    I         *-------------------*
I VOLUME(1))/MYEARS I    I         I    TRUCKS(2) =    I
I                   I    I         I   (TRUCKS(2) -    I
I    VOLUME(1) =    I    I         I TRUCKS(1))/MYEARS I
I    VOLUME(1) -    I    I         I                   I
I     VOLUME(2)     I    I         I    TRUCKS(1) =    I
*-------------------*    I         I    TRUCKS(1) -    I
          I              I         I     TRUCKS(2)     I
          I              I         *-------------------*
          I              I                   I
**  CONVERT INITIAL      I                   I
AND FINAL %              I                   I
COMMERCIAL TO BASE       I         **  CONVERT INITIAL
YEAR & YEARLY INCRE      I         AND FINAL AM. PM.
          I              I         SPLIT TO BASE YEAR &
          I              I         YEARLY INCR
          +--------------+                   I
                                             I
                                             I          08
                                   *-------------------*
                                   I    SPLIT(2) =     I
                                   I    (SPLIT(2) -    I
                                   I SPLIT(1))/MYEARS  I
                                   I                   I
                                   I    SPLIT(1) =     I
                                   I    SPLIT(1) -     I
                                   I     SPLIT(2)      I
                                   *-------------------*
                                             I
                                             I
                                             I 09
                                         ---------
                                         *  EXIT  *
                                         ---------
```

```
      INTEGER COSTS(7,5,8,2)
      COMMON          ARHO,           CAP(5),         COSTS,
       CWT,           OVOL(24),       HVOL(24),       IO,
       IHOUR(24,7),   ITYPE,          IY,             KP,
       LANES,         MI,             MO,             NYEARS,
       OCOSTS(65,2),  PATCHF(1000),   PATCHP(1000),   PROJLN,
       RLOC(1000),    SIM(7,5),       SP(5,11),       SPEEOO(24),
       SPEEON(24),    SPLIT(2),       SWORK(7),       TRUCKS(2),
       VOLUME(2),     VTRATE(5,40),   ZONEL(7,4)
      COMMON/ASSUME/  ALIGN(3,6),     AACOST,         COMVOT,
       OETOUR(7),     OLIFE,          FUEL(2),        HRS(7,24,4),
       HWORK(7),      IDIR,           INC,            IPRINT,
       IWT,           JPRINT,         OCSCHL,         OCWORK,
       OIL(2),        OVER(12,7),     PCTADT(24,7,2,2),PS(7,3,3),
       PSIRS,         RATEI,          RLIFE,          SINOEX,
       SLIMIT(5),     TCMOVE,         TIRES(2),       TLEVEL(7),
       WALK,          WIDTH,          WEIGHT(10,3)
      DIMENSION CCAP(5,3)
      DIMENSION INOCC(10,3),IBAL(7,2,2),Z(24),SSIM(7,3,5)
      DIMENSION RANOOM(2),PERCNT(6,2,2)
      OATA ENOVER/' ENO'/
      OATA CCAP/1.7,.8,4.,0.0,0.0,3.8,1.7,.8,6.,0.0,5.7,3.8,1.7,.8,8./
      DATA OSPEEO/70./
      OATA IBAL/28*0/
      OATA INOCC/30*0/
      STATEMENT FUNCTION DEFINITION:  INOCC(10,1)=10
      STATEMENT FUNCTION DEFINITION:  INOCC(10,2)=7
      STATEMENT FUNCTION OEFINITION:  INOCC(10,3)=18
      STATEMENT FUNCTION OEFINITION:  INOCC(9,1)=3
      STATEMENT FUNCTION OEFINITION:  INOCC(9,2)=15
      STATEMENT FUNCTION DEFINITION:  INOCC(9,3)=I8
      DATA SSIM/1.,2.,1.,3.,2.,1.,3.,1.,3.,I.,3.,3.,3.,3.,1.,3.,1.,
      3.,2.,3.,3.,1.,1.,0.,12.,3.,10.,1500.,1.,12.,.1,0.,0.,0.,1500.,
      10.,0.,0.,12.,3.,0.,1500.,0.,0.,I.,0.,10.,0.,0.,0.,0.,0.,0.,0.,
      0.,0.,0.,0.,1.,0.,10.,0.,0.,100.0,I00.0,1.,250.0,100.,I00.0,10.,
      100.0,250.0,100.,1.,I.,1.,10.,100.0,1.,1.,250.0,100.,1.,10.,1.,1.,
      1.,2.,1.,1.,2.,1.,1.,1.,1.,I.,1.,2.,1.,1.,1.,2.,1.,1.,2./
      OATA PERCNT/.331,.189,.284,.001,.095,.100,
      .331,.189,.284,.001,.095,.100,
      .331,.I89,.284,.001,.095,.I00,
      .33I,.189,.284,.001,.095,.100/
1     FORMAT(I2,A4)
2     FORMAT(3I2,24F3.3)
3     FORMAT(2I2,3F7.2)
4     FORMAT(2I2,6F3.3)
5     FORMAT(3F5.0)
6     FORMAT(I2,5F10.2)
```

```
 -----------
 / OPPARA /
 -----------

02.03--->*

SUBROUTINE VTIME

 ***INITIALIZE SCALE
FACTORS,INTERCEPTS,
AND COEFFICIENTS OF
BENEFITS E

** I IS THE MAXIMUM
ACCURATE VALUE OF
TIME FOR WORK TRIPS

            *
            I          01
*--------------------*
I      I = 40        I
*--------------------*
            I
            I
            I
** THE VALUE OF TIME
PER VEHICLE
CONVERSION FACTOR FOR
WORK TRIPS IS
** THE PASSENGERS
PER VEHICLE
            I
            I
            I          02
*--------------------*
I  FACT1 = OCWORK    I
*--------------------*
            I
            I
            I
   DO LOOP FOR EACH
PASSENGER CAR TRIP
PURPOSE
            I
            I
            I  NOTE  03
* * * * * * * * * * *
*   BEGIN DO LOOP   *
*  1510 IT = 1, 5   *
* * * * * * * * * * *
            I
 30.21--->I
            I
*   COMPUTE HOURLY
VALUE OF TIME SAVINGS
BETWEEN 5 AND 14
MINUTES
            I
            I
            I  NOTE  04
* * * * * * * * * * *
*   BEGIN DO LOOP   *
*  1520 J = 5, 14   *
* * * * * * * * * * *
            I
            I<-----------I-----+
            I
** FACT2 IS THE
VALUE OF THE BENEFITS
FUNCTION FOR A TIME
SAVINGS J
            I
            I
            I          05
*--------------------*
I FACT2 = BO(IT) +   I
I    J*(BT(IT) +     I
I    BIT(IT)*INC)    I
*--------------------*
            I
            I
            I
** FACT3 IS THE
PERCENTILE OF
MOTORISTS HAVING ZERO
BENEFITS
            I
            I
            +-------------+
```

```
+------------------>*
                    I          07
*--------------------*
I      FACT3 =       I
I   1.0/(1.0 +       I
I EXP(AC(IT)*FACT2)  I
I          )         I
*--------------------*
            I
            I
            I
** FACT4 IS THE
PERCENTILE OF
MOTORISTS HAVING THE
AVERAGE BENEFIT
            I
            I
            I          08
*--------------------*
I FACT4 = (1.0 +     I
I     FACT3)/2       I
*--------------------*
            I
            I
            I
** FACT5 IS THE
AVERAGE BENEFIT OF
ALL MOTORISTS HAVING
A TIME SAVIGS
            I
            I
            I          09
*--------------------*
I  FACT5 = (1.0 -    I
I  FACT3)*(FACT2 +   I
I ALOG(FACT4/(1.0 -  I
I  FACT4))/AC(IT))   I
*--------------------*
            I
            I
            I
** VTRATE IS THE
VALUE OF TIME PER
VEHICLE IN DOLLARS
PER HOUR
            I
            I
            I          10
*--------------------*
I  VTRATE(IT,J) =    I
I  FACT5/100/J*60*   I
I       FACT1        I
*--------------------*
            I
            I
            I
    1520   *    11
         *   *
       *       *
NO   *           *
+-----*  END OF DO  *
I      *  LOOP?  *
I        *     *
I          * *
I           *
------+    IYES
            I
            I
            I
            I
            I
            I
*   COMPUTE THE
HOURLY VALUE OF TIME
SAVINGS BETWEEN 14
AND I MINUTES
            I
            I
            I
** BO2 IS THE
INTERCEPT  OF THE
BENEFITS FUNCTION FOR
A TIME SAVING O
** GREATER THE 14
MINUTES
            I
            I
            +-------------+
```

```
+------------------>*
                    I          13
*--------------------*
I  BO2 = BO(IT) +    I
I  14.0*(BT(IT) -    I
I     BTP(IT) +      I
I     BIT(IT) -      I
I  BITP(IT))*INC)    I
*--------------------*
            I
            I
            I
** FACT6 IS THE
VALUE OF THE BENEFITS
FUNCTION FOR A TIME
SAVINGS
** BETWEEN 5 AND 14
MINUTES AT 14.5
MINUTES
            I
            I
            I          14
*--------------------*
I FACT6 = BO(IT) +   I
I  14.5*(BT(IT) +    I
I   BIT(IT)*INC)     I
*--------------------*
            I
            I
            I
** FACT7 IS THE
PERCENTILE OF
MOTORISTS HAVING ZERO
BENEFITS FOR A TI
** SAVINGS OF 14.5
MINUTES USING THE
BENEFITS FUNCTION FOR
A TIME
** SAVINGS BETWEEN 5
AND 14 MINUTES
            I
            I
            I          15
*--------------------*
I      FACT7 =       I
I   1.0/(1.0 +       I
I EXP(AC(IT)*FACT6)  I
I          )         I
*--------------------*
            I
            I
            I
** TEMP1 IS THE
AVERAGE BENEFIT OF
ALL MOTORISTS HAVING
A TIME SAVING
** OF 14.5 MINUTES
USING THE BENEFITS
FUNCTION FOR A TIME
SAVINGS BET
** 5 AND 14 MINUTES
            I
            I
            I          16
*--------------------*
I  TEMP1 = (1.0 -    I
I  FACT7)*(FACT6 +   I
I     ALOG((1 +      I
I    FACT7)/(1 -     I
I  FACT7))/AC(IT))   I
*--------------------*
            I
            I
            I
** FACT8 IS THE
VALUE OF THE BENEFITS
FUNCTION FOR A TIME
SAVINGS OF
** GREATER THEN 14
MINUTES AT 14.5
MINUTES
            I
            I
            I          17
*--------------------*
I  FACT8 = BO2 +     I
I  14.5*(BTP(IT) +   I
I   BITP(IT)*INC)    I
*--------------------*
            I
            I
            +-------------+
```

```
+------------------>*
                    I
** FACT9 IS THE
PERCENTILE OF
MOTORISTS HAVING ZERO
BENEFITS FOR A TI
** SAVINGS OF 14.5
MINUTES USING THE
BENEFITS FUNCTION FOR
A TIME SAV
** OF GREATER THAN
14 MINUTES
            I
            I
            I          18
*--------------------*
I      FACT9 =       I
I   1.0/(1.0 +       I
I   EXP(ACP(IT)      I
I     *FACT8))       I
*--------------------*
            I
            I
            I
** TEMP2 IS THE
AVERAGE BENEFIT OF
ALL MOTORISTS HAVING
A TIME SAVING
** 14.5 MINUTES
USING THE BENEFITS
FUNCTION FOR TIME
SAVINGS GREATER
** MINUTES
            I
            I
            I          19
*--------------------*
I  TEMP2 = (1.0 -    I
I  FACT9)*(FACT8 +   I
I     ALOG((1 +      I
I    FACT9)/(1 -     I
I FACT9))/ACP(IT))   I
*--------------------*
            I
            I
            I
** COMPUTE THE
ADJUSTMENT TO BE
ADDED TO THE BENEFITS
FUNCTION FOR
** TIME SAVINGS OF
GREATER THAN 14
MINUTES
** TEMP3 IS THE
ADJUSTMENT NECESSARY
TO THE VALUES OF TIME
SAVINGS
** OF GREATER THAN
14 MINUTES TO MAKE
THE VALUE OF TIME A
CONTINUOUS
            I
            I
            I          20
*--------------------*
I  TEMP3 = TEMP1 -   I
I       TEMP2        I
*--------------------*
            I
            I
            I
*   COMPUTE THE
HOURLY VALUE OF TIME
FOR TIME SAVINGS
BETWEEN 15 AND
*   I MINUTES
            I
            I
            I  NOTE  21
* * * * * * * * * * *
*   BEGIN DO LOOP   *
*  1530 J = 15, I   *
* * * * * * * * * * *
            I
 30.06--->I
            I
** FACT2 IS THE
VALUE OF THE BENEFITS
FUNCTION FOR A TIME
SAVINGS J
            I
            I
            I
            I  /
          -----
         /30.01
```

```
29.22--->*
         01
FACT2 = BO2 +
J*(BTP(IT) +
BITP(IT)*INC)

** FACT3 IS THE
PERCENTILE OF
MOTORISTS HAVING ZERO
BENEFITS
         02
FACT3 =
1.0/(1.0 +
EXP(ACP(IT)
*FACT2))

** FACT4 IS THE
PERCENTILE OF
MOTORISTS HAVING THE
AVERAGE BENEFIT
         03
FACT4 = (1.0 +
FACT3)/2

** FACT5 IS THE
AVERAGE BENEFIT OF
ALL MOTORISTS HAVING
A TIME SAVING
         04
FACT5 = (1.0 -
FACT3)*(FACT2 +
ALOG(FACT4/(1.0 -
FACT4))/ACP(IT))
+ TEMP3

** VTRATE IS THE
VALUE OF TIME PER
VEHICLE IN DOLLARS
PER HOUR
         05
VTRATE(IT,J) =
FACT5/100/J*60*
FACT1

1530  *  06
END OF DO     NO
LOOP?
  YES    . 29 .
         . 22 .

** THE VALUE OF TIME
PER VEHICLE
CONVERSION FACTOR FOR
SOCIAL-RECREAT


** PERSONAL
BUSSINESS, AND
VACATION TRIPS IS 1
         08
FACT1 = 1

** THE VALUE OF TIME
PER VEHICLE
CONVERSION FACTOR FOR
SCHOOL TRIPS I
** THE PASSENGERS
PER VEHICLE
         09
FALSE  IT .EQ. 4
       TRUE
         10
FACT1 = OCSCHL

* THE HOURLY RATE
FOR ALL TIME SAVINGS
GREATER THAN I IS THE
SAME AS
* THE RATE FOR A
TIME SAVINGS OF I
MINUTES
      NOTE 11
* BEGIN DO LOOP *
* 1540 J = I, 40 *
         12
VTRATE(IT,J) =
VTRATE(IT,I)

1540  *  13
NO  END OF DO
    LOOP?
    YES

* THE HOURLY RATE
FOR A TIME SAVINGS OF
LESS THAN 5 MINUTES
IS THE R
* OF TIME SAVINGS
FOR A 5 MINUTE TIME
SAVINGS


      NOTE 15
* BEGIN DO LOOP *
* 1550 J = 1, 5 *
         16
VTRATE(IT,J) =
VTRATE(IT,5)

1550  *  17
NO  END OF DO
    LOOP?
    YES
         18
COMPUTED GO TO
FOR IT
1560      30.19
1570      30.20
1570      30.20
1560      30.19
1510      30.21

IF OUTSIDE THE RANGE

** INITIALIZE
SUBSCRIPT FOR MAXIMUM
ACCURATE VALUE OF
TIME RATE FOR
**
SOCIAL-RECREATIONAL
AND SCHOOL TRIPS
30.18*-->I
1560     19
I = 20


** INITIALIZE
SUBSCRIPT FOR MAXIMUM
ACCURATE VALUE OF
TIME RATE FOR
** PERSONEL
BUSSINESS AND
VACATION TRIPS
30.18*-->*
1570     20
I = 30
---------30.18*-->I
1510  *  21
END OF DO     NO
LOOP?
 YES     . 29 .
         . 04 .

SUBROUTINE OPCOST
      NOTE 22
* BEGIN DO LOOP *
* 1981 I = 1, 65 *
         23
OCOSTS(I,1) = 0
OCOSTS(I,2) = 0

1981  *  24
NO  END OF DO
    LOOP?
    YES

***DETERMINE
OPERATION PARAMETER
FOR 65 SPEEDS
      NOTE 25
* BEGIN DO LOOP *
* 1400 IS = 1, 65 *
33.27--->I
         26
SS = IS

***FUEL CONSUMPTION
IN GALLONS PER
PASSENGER CAR VEHICLE
PER HOUR
/31.01
```

```
30.27--->*

***INITIALIZE
TEMPORARY VARIABLES
                                01
I     TEMP1 = 0     I
I     TEMP2 = 0     I

***FUEL CONSUMPTION
MODEL FOR LEVEL
TANGENT SECTIONS
                                02
I      TEMP3 =      I
I   EXP(-.4844 +    I
I     .0285*IS)     I

***FUEL CONSUMPTION
MODELS FOR POSITIVE
GRADES
                          NOTE  03
*   BEGIN DO LOOP   *
*   1405 I = 1, 6   *

I<------------
*   04
*  ALIGN(1,I)  *-----  TRUE
*   .EQ. 0   *
IFALSE
                                05
I    A = - .45 +    I
I      .0278*IS     I
I     B = .0348 +   I
I  .0214*ALOG(SS)   I

***ACCUMULATE
PRORATED FUEL
CONSUMPTION FOR
POSITIVE GRADES
                                06
I   TEMP1 = TEMP1 +  I
I      EXP(A +       I
I   B*I)*ALIGN(1,I)  I
I      /PROJLN       I

***ACCUMULATE
MILEAGE ASSOCIATED
WITH POSITIVE GRADES
                                07
I   TEMP2 = TEMP2 +  I
I     ALIGN(1,I)     I


-----------31.04*-->*
1405   *   08
NO  *  END OF DO   *
*    LOOP?   *
IYES

***FUEL CONSUMPTION
MODELS FOR NEGATIVE
GRADES
                          NOTE  09
*   BEGIN DO LOOP   *
*   1406 I = 1, 6   *

31.18--->I
*   10
*  ALIGN(2,I)  *-----  TRUE
*   .EQ. 0   *
IFALSE

***COMPUTE FLOAT
SPEED
                                11
I  TEMP5 = 3 + 7*I  I

***INITIALIZE
TEMP4,THE INCREMENT
OF FUEL CONSUMPTION
ABOVE FLOAT SPE
                                12
I     TEMP4 = 0     I

***TEST TO DETERMINE
IF THE FLOAT SPEED IS
EXCEEDED
*   13
* IS .LT. TEMP5 *------------  TRUE
IFALSE
/31.14


31.13--->*

***COMPUTE THE
INCREMENT OF FUEL
CONSUMPTION ABOVE
FLOAT SPEED
                                14
I  TEMP4 = TEMP3 -  I
I   EXP(-.4844 +    I
I   .0285*TEMP5)    I

***COMPUTE THE FUEL
CONSUMPTION
ASSOCIATED WITH
SPEEDS BELOW FLOAT SP
------------>I
1416                            15
I TEMP6 = I/(1.61 + I
I       .I*IS)      I

***ACCUMULATE
PRORATED FUEL
CONSUMPTION FOR
POSITIVE AND NEGATIVE
GRA
                                16
I  TEMP1 = TEMP1 +  I
I      (TEMP6 +     I
I TEMP4)*ALIGN(2,I) I
I      /PROJLN      I

***ACCUMULATE
MILEAGE ASSOCIATED
WITH POSITIVE AND
NEGATIVE GRADES
                                17
I  TEMP2 = TEMP2 +  I
I     ALIGN(2,I)    I
------------->I
1406   *   18
*  END OF DO   *-+  NO
*    LOOP?   *
IYES      . 31 .
          . 10 .

***FUEL CONSUMPTION
MODELS FOR HORIZONTAL
ALIGNMENT
                          NOTE  19
*   BEGIN DO LOOP   *
*   1407 I = 1, 6   *


------------------>*<-----------
*   20
TRUE *  ALIGN(3,I)  *
*   .EQ. 0   *
IFALSE
                                21
I       C = I       I
I   A = - .483 -    I
I   .087*ALOG(C)    I
I B = EXP(-3.562 +  I
I      .044*I)      I

***COMPUTE EXCESS
FUEL CONSUMPTION
ASSOCIATED WITH
HORIZONTAL ALIGNME
                                22
I  TEMP4 = EXP(A +  I
I   B*IS) - TEMP3   I

***TEST TO BE SURE
ANY EXCESS IS
POSITIVE
*   23
TRUE
I<----* TEMP4 .LT. 0  *
IFALSE

***ADD EXCESS FUEL
CONSUMPTION
ASSOCIATED WITH
HORIZONTAL ALIGNMENT
                                24
I  TEMP1 = TEMP1 +  I
I TEMP4*(ALIGN(3,I) I
I      /PROJLN)     I
+----31.20*-->I
1407   *   25
*  END OF DO   *-----+  NO
*    LOOP?   *
IYES
/32.01
```

```
31.25--->*
         I
***HOLD FUEL
CONSUMPTION FOR 4000
LB. PASSENGER VEHICLE
PER HOUR BY S
         I
         I
  1408   I        01
*-------------------*
I  OCOST(IS,1,I) =  I
I      TEMP1 +      I
I  TEMP3*(PROJLN -  I
I   TEMP2)/PROJLN   I
*-------------------*
         I
         I
         I
***TIRE WEAR IN .001
INCHES OF WEAR PER
VEHICLE PER HOUR
***INITIAL TEMPORARY
VARIABLES
         I
         I
         I        02
*-------------------*
I     TEMP1 = 0     I
I                   I
I     TEMP2 = 0     I
*-------------------*
         I
         I
         I
***TIRE WEAR MODEL
FOR LEVEL TANGENT
SECTIONS
         I
         I
         I        03
*-------------------*
I      TEMP3 =      I
I   EXP(-8.265 +    I
I  2.226*ALOG(SS))  I
*-------------------*
         I
         I
         I
***TIRE WEAR MODELS
FOR POSITIVE GRADES
         I
         I
         I  NOTE  04
* * * * * * * * * * *
*   BEGIN DO LOOP   *
*   1410 I = 1, 6   *
* * * * * * * * * * *
         I
32.10--->I
         I
         *    05
       *   *
     *       *
   *           *  TRUE
 *  ALIGN(1,I)   *-----+
   *  .EQ. 0   *
     *       *
       *   *
         *
         IFALSE
         I
         I
         I
         I
         I
         I        06
*-------------------*
I   A = - 8.26 +    I
I     .095*I        I
I                   I
I B = 2.23 - .015*I I
*-------------------*
         I
         I
         I
***ACCUMULATE
PRORATED TIRE WEAR
FOR POSITIVE GRADES
         I
         I
         +-------------------+

+------------->*
         I        08
*-------------------*
I  TEMP1 = TEMP1 +  I
I    (EXP(A +       I
I   B*ALOG(SS))     I
I   *ALIGN(1,I)     I
I    /PROJLN)       I
*-------------------*
         I
         I
         I
***ACCUMULATE
MILEAGE ASSOCIATED
WITH POSITIVE GRADES
         I
         I
         I        09
*-------------------*
I  TEMP2 = TEMP2 +  I
I    ALIGN(1,I)     I
*-------------------*
         I
+------I------------>I
         I
  1410   *   10
       *   *
     *       *
   *           *  NO
 *  END OF DO    *-+
   *  LOOP?    *   I
     *       *     I
       *   *       I
         *       ....
         IYES   . 32 .
         I      . 05 .
         I       ....
         I
         I
         I
***TIRE WEAR MODELS
FOR NEGATIVE GRADES
         I
         I
         I  NOTE  11
* * * * * * * * * * *
*   BEGIN DO LOOP   *
*   1411 I = 1, 6   *
* * * * * * * * * * *
         I
32.16--->I
         I
         *   12
       *   *
     *       *
   *           *  TRUE
 *  ALIGN(2,I)   *-----+
   *  .EQ. 0   *
     *       *
       *   *
         *
         IFALSE
         I
         I
         I
         I
         I
         I        13
*-------------------*
I A = - 8.26 + .2*I I
I                   I
I B = 2.23 - .07*I  I
*-------------------*
         I
         I
         I
***ACCUMULATE
PRORATED TIRE WEAR
FOR POSITIVE AND
NEGATIVE GRADES
         I
         I
         I        14
*-------------------*
I  TEMP1 = TEMP1 +  I
I    (EXP(A +       I
I   B*ALOG(SS))     I
I   *ALIGN(2,I)     I
I    /PROJLN)       I
*-------------------*
         I
         I
         +-------------------+

+------------->*
         I
***ACCUMULATE
MILEAGE ASSOCIATED
WITH POSITIVE AND
NEGATIVE GRADES
         I
         I
         I        15
*-------------------*
I  TEMP2 = TEMP2 +  I
I    ALIGN(2,I)     I
*-------------------*
         I
+-----I------------->I
         I
  1411   *   16
       *   *
     *       *
   *           *  NO
 *  END OF DO    *-+
   *  LOOP?    *   I
     *       *     I
       *   *       I
         *       ....
         IYES   . 32 .
         I      . 12 .
         I       ....
         I
         I
         I
         I
***TIRE WEAR MODELS
FOR HORIZONTAL
ALIGNMENT
         I
         I
         I  NOTE  17
* * * * * * * * * * *
*   BEGIN DO LOOP   *
*   1412 I = 1, 6   *
* * * * * * * * * * *
         I
         I<------------I-----+
         I        18
*-------------------*
I       C = I       I
*-------------------*
         I
         I
         I
         *   19
       *   *
     *       *
   *           *  TRUE
 *  ALIGN(3,I)   *-----+
   *  .EQ. 0   *       A
     *       *
       *   *
         *
         IFALSE
         I
         I
         I
         I
         I        20
*-------------------*
I   A = - 3.1 +     I
I   .59*ALOG(C)     I
I                   I
I    B = .077 +     I
I     .0023*I       I
*-------------------*
         I
         I
         I
***ADD EXCESS TIRE
WEAR ASSOCIATED WITH
HORIZONTAL ALIGNMENT
         I
         I
         I        21
*-------------------*
I  TEMP1 = TEMP1 +  I
I (EXP(A + B*IS) -  I
I TEMP3)*(ALIGN(3,  I
I    I)/PROJLN)     I
*-------------------*
         I
         I
         +------------+

+----------32.19*--->*
         I
  1412   *   22
       *   *
     *       *
NO *           *
+-----*  END OF DO   *
I    *  LOOP?    *
I      *       *
I        *   *
I          *
I          IYES
I          I
I          I
I          I
I          I
I          I
I  ***HOLD TIRE WEAR
I  FOR 4000 LB.
I  PASSENGER VEHICLE PER
I  HOUR BY SPEED
I          I
I          I
I   1413   I        23
I  *-------------------*
I  I  OCOST(IS,2,1) =  I
I  I      TEMP1 +      I
I  I  TEMP3*(PROJLN -  I
I  I   TEMP2)/PROJLN   I
I  *-------------------*
I          I
I          I
I          I
I  ***OIL CONSUMPTION
I  IN QUARTS PER
I  PASSENGER CAR VEHICLE
I  PER HOUR
I          I
I          I
I          I
I  ***OIL CONSUMPTION
I  MODELS FOR VERTICAL
+- ALIGNMENT
   ***INITIAL TEMPORARY
   VARIABLES
           I
           I
           I        24
   *-------------------*
   I     TEMP1 = 0     I
   I                   I
   I     TEMP2 = 0     I
   *-------------------*
           I
           I
           I
   ***OIL CONSUMPTION
   FOR LEVEL TANGENT
   SECTIONS
           I
           I
           I        25
   *-------------------*
   I      TEMP3 =      I
   I   EXP(-3.414 +    I
   I    .0242*IS)      I
   *-------------------*
           I
           I
           I  NOTE  26
   * * * * * * * * * * *
   *   BEGIN DO LOOP   *
   *   1420 I = 1, 6   *
   * * * * * * * * * * *
           I
   33.05--->I
           I        27
   *-------------------*
   I      TEMP4 =      I
   I   ALIGN(1,I) +    I
   I    ALIGN(2,I)     I
   *-------------------*
           I
           I
           I
           I  /
         -----
        /33.01
```

```
32.27--->*
         01
TRUE * TEMP4 .EQ. 0 *
         IFALSE
                          02
  A = - 3.414 -
     .0184*I

  B = .0242 +
     .00142*I

***ACCUMULATE
PRORATED OIL
CONSUMPTION FOR
VERTICAL ALIGNMENT
                          03
  TEMP1 = TEMP1 +
     (EXP(A +
     B*IS))
     *TEMP4/PROJLN

***ACCUMULATE
MILEAGE ASSOCIATED
WITH VERTICAL
ALIGNMENT
                          04
  TEMP2 = TEMP2 +
     TEMP4

1420    *   05
  END OF DO   *-+  NO
    LOOP?
          IYES     . 32 .
                   . 27 .

***HOLD OIL
CONSUMPTION FOR 4000
LB. PASSENGER VEHICLE
PER HOUR BY SP

1421    I         06
  OCOST(IS,3,1) =
     TEMP1 +
  TEMP3*(PROJLN -
     TEMP2)/PROJLN

***PASSENGER VEHICLE
MAINTENANCE COST IN
DOLLARS PER HOUR FOR
SPEED I
```

```
***MAINTENANCE COST
MODEL FOR LEVEL
TANGENT SECTIONS
                          08
      TEMP3 =
  EXP(-5.828 +
  1.278*ALOG(SS))

***INITIAL TEMPORARY
VARIABLES
                          09
      TEMP1 = 0

      TEMP2 = 0

***MAINTENANCE COSTS
MODELS FOR POSITIVE
GRADES
               NOTE   10
*   BEGIN DO LOOP    *
*   1430 I = 1, 6    *

33.16--->I
           *   11
  ALIGN(1,I)   *-----+  TRUE
   .EQ. 0
        IFALSE
                          12
   A = 5.828 -
      .014*I

   B = 1.278 +
      .001*I

***ACCUMULATE
PRORATED MAINTENANCE
COSTS FOR POSITIVE
GRADES
                          13
  TEMP1 = TEMP1 +
     EXP(-A +
     B*ALOG(SS))
     *ALIGN(1,I)
     /PROJLN

***ACCUMULATE
MILEAGE ASSOCIATED
WITH POSITIVE GRADES
```

```
                          15
  TEMP2 = TEMP2 +
    ALIGN(1,I)

1430    *   16
  END OF DO   *-+  NO
    LOOP?
          IYES     . 33 .
                   . 11 .

***MAINTENANCE COSTS
MODELS FOR NEGATIVE
GRADES
               NOTE   17
*   BEGIN DO LOOP    *
*   1431 I = 1, 6    *

           *   18
  ALIGN(2,I)   *-----+  TRUE
   .EQ. 0
        IFALSE
                          19
   A = 5.828 -
      .0285*I

   B = 1.278 -
      .011*I

***ACCUMULATE
PRORATED MAINTENANCE
COSTS FOR POSITIVE
AND NEGATIVE GR
                          20
  TEMP1 = TEMP1 +
     EXP(-A +
     B*ALOG(SS))
     *ALIGN(2,I)
     /PROJLN

***ACCUMULATE
MILEAGE ASSOCIATED
WITH POSITIVE AND
NEGATIVE GRADES
                          21
  TEMP2 = TEMP2 +
    ALIGN(2,I)
```

```
+----------33.18*-->*
1431    *   22
NO  *  END OF DO   *
        LOOP?
        IYES

***HOLD MAINTENANCE
COST FOR 4000 LB.
PASSENGER VEHICLE PER
HOUR BY S

1432    I         23
  OCOST(IS,4,1) =
     TEMP1 +
  TEMP3*(PROJLN -
    TEMP2)/PROJLN

***DEPRECIATION RATE
FOR PASSENGER CARS
PER HOUR AT SPEED IS

***ANNUAL PASSENGER
MILEAGE IS A FUNCTION
OF SPEED IS
                          24
      TEMP1 =
   1974*IS**.489

***YEARS TO SCRAP IS
A FUNCTION OF ANNUAL
MILEAGE
                          25
  TEMP2 = 47.5 -
  3.88*ALOG(TEMP1)

***THE HOURLY
DEPRECIATION RATE OF
PASSENGER CARS IS
(1/LIFEMILEAGE/S
                          26
  OCOST(IS,4,2) =
  1/((TEMP1*TEMP2)
      /IS)

1400    *   27
  END OF DO   *-+  NO
    LOOP?
        IYES       . 30 .
                   . 26 .

/34.01
```

```
 33.27--->*
          I
 ***CONVERSION OF
PASSENGER CAR
OPERATION PARAMETERS
TO COMPOSITE COMM
          I
          I
          I
 ***CONVERT FOR 65
SPEEDS
          I
          I
          I  NOTE  01
* * * * * * * * * * *
*   BEGIN DO LOOP   *
*  1450 IS = 1, 65  *
* * * * * * * * * * *
          I
 36.04--->I
          I
 ***ADDRESS THE
PARAMETERS
FUEL,TIRES,OIL AND
MAINTENANCE
          I
          I
          I  NOTE  02
* * * * * * * * * * *
*   BEGIN DO LOOP   *
*  1451 I1 = 1, 4   *
* * * * * * * * * * *
          I
 36.03--->I
          I
 ***INITIATE THE
VEHICLE WEIGHT
COUNTER
          I
          I
          I          03
*--------------------*
I       I = 1        I
*--------------------*
          I
          I
          I
 ***BRANCH TO
APPROPRIATE OPERATION
PARAMETER
          I
          I
          I          04
*--------------------*
I   COMPUTED GO TO   I
I      FOR  I1       I
*--------------------*
I  1453        34.05 I
I  1454        34.09 I
I  1455        34.12 I
I  1456        35.01 I
*--------------------*
          I
          I
          I
IF OUTSIDE THE RANGE
          I
          I
          I
 ***FUEL CONSUMPTION
WEIGHT RATIO FACTOR
COMPUTATION
          I
 34.04*-->I
  1453    I          05
*--------------------*
I   A = 1/(.46 +     I
I    .0344*IS -      I
I   .00031*IS**2)    I
I                    I
I   B = 1/(.78 +     I
I    .0437*IS -      I
I   .00047*IS**2)    I
*--------------------*
          I                +-------------------->*
          I                I                     I         07
          I          06    I          *--------------------*
*--------------------*     I          I   COMPUTED GO TO   I
I   RW = EXP(-A +    I     I          I      FOR  I        I
I B*(ALOG(WEIGHT(I,  I     I          *--------------------*
I       1))))        I     I          I  1457        35.09 I
*--------------------*     I          *--------------------*
          I                I                     I
          I                I                     I
          +----------------+                     I
                                       IF OUTSIDE THE RANGE
                                                 I
                                                 I
                                                 I 08
                                                ...
                                               .   .
                                              .35.20.
                                               .   .
                                                ... 1459
```

```
 ***TIRE WEAR WEIGHT
RATIO FACTOR
COMPUTATION

 34.04*-->*
  1454    I          09
*--------------------*
I    RW = .76 +      I
I .061*WEIGHT(I,1)   I
*--------------------*
          I
          I
          I          10
*--------------------*
I   COMPUTED GO TO   I
I      FOR  I        I
*--------------------*
I  1457        35.09 I
*--------------------*
          I
          I
          I
IF OUTSIDE THE RANGE
          I
          I
          I 11
         ...
        .   .
       .35.20.
        .   .
         ... 1459
```

```
 ***OIL CONSUMPTION
WEIGHT RATIO FACTOR
COMPUTATION

 34.04*-->*
  1455    I          12
*--------------------*
I    A = .930 +      I
I     .003*IS        I
I                    I
I   B = - .0149 +    I
I    .00004*IS       I
I                    I
I    RW = 1/(A +     I
I  B*WEIGHT(I,1))    I
*--------------------*
          I
          I
          I
          *   13
        *   *
      *       *
TRUE *           *
+-----*  WEIGHT(I,1)  *
I      *  .LE. 50  *
I        *       *
I          *   *
I            *
I            IFALSE
I            I
I            I
I            I
I            I
I            I
I            I          14
I   *--------------------*
I   I      RW =          I
I   I   3*WEIGHT(I,1)    I
I   I    /(30 + IS)      I
I   *--------------------*
I            I
+----------->I
  1452       I  NOTE  15
   * * * * * * * * * * *
   *     CONTINUE      *
   * * * * * * * * * * *
             I
             I
             I          16
   *--------------------*
   I   COMPUTED GO TO   I
   I      FOR  I        I
   *--------------------*
   I  1457        35.09 I
   *--------------------*
             I
             I
             I
IF OUTSIDE THE RANGE
             I
             I
             I 17
            ...
           .   .
          .35.20.
           .   .
            ... 1459
```

```
   ***MAINTENANCE COSTS
   WEIGHT RATIO FACTOR
   COMPUTATIUN

    34.04*-->*
      1456    I          01
   *--------------------*
   I FACT1 = IABS(IS -  I
   I         20)        I
   I                    I
   I      A = .12 +     I
   I    .0084*FACT1     I
   I                    I
   I      B = .315 +    I
   I    .0021*FACT1     I
   I                    I
   I    C = .00438 +    I
   I    .000023*FACT1   I
   *--------------------*
             I
             I
             I           02
   *--------------------*
   I     RW = - A +     I
   I  B*WEIGHT(I,1) -   I
   I C*WEIGHT(I,1)**2   I
   *--------------------*
             I
             I
             I
             *    03
          *     *
       *           *
 TRUE *               *
+-----*   WEIGHT(I,1)   *
I        * .LE. 50.0 *
I          *       *
I             *  *
I               *
I            IFALSE
I               I
I               I
I               I
I               I
I               I
I               I           04
I  *--------------------*
I  I     RW = 4.68 +    I
I  I    .039*FACT1 +    I
I  I .0772*(WEIGHT(I,   I
I  I      1) - 50)      I
I  *--------------------*
I             I
+------------>I
      1466    I   NOTE  05
   * * * * * * * * * * *
   *     CONTINUE        *
   * * * * * * * * * * *
             I
             I
             I
   ***DEPRECIATION
   WEIGHT RATIU FACTOR
   COMPUTATION
             I
             I
             I           06
   *--------------------*
   I      TEMP3 =       I
   I     EXP(.163 -     I
   I .031*WEIGHT(I,1))  I
   *--------------------*
             I
             I
             I           07
   *--------------------*
   I   COMPUTED GO TO   I
   I      FOR  I        I
   *--------------------*
   I  1457        35.09 I
   *--------------------*
             I
             I
             I
   IF OUTSIDE THE RANGE
             I
             I
             I 08
            ...
          .     .
          .35.19.
          .     .
            ... 1461
```

```
   ***HOLD PASSENGER
   CAR WEIGHT RATIO IN
   FACT2

    34.07*-->*
      1457    I          09
   *--------------------*
   I     FACT2 = RW     I
   *--------------------*
             I
             I
             I
             *    10
          *     *
       *           *
 TRUE *               *
+-----*    II .NE. 4    *
I        *           *
I          *       *
I             *  *
I               *
I            IFALSE
I               I
I               I
I               I
I               I
I               I
I  ***MAINTENANCE COSTS
I  FUR PASSENGER CAR
I  FACTORED BY SERVICES
I  INDEX
I               I
I               I
I               I          11
I  *--------------------*
I  I OCOST(IS,I1,1) =   I
I  I  OCOST(IS,I1,1)    I
I  I     *SINDEX        I
I  *--------------------*
I               I
I               I
I               I
I  ***DEPRECIATION RATE
I  FOR PASSENGER CAR
I  CONVERTED TO DOLLARS
I               I
I               I
I               I          12
I  *--------------------*
I  I OCOST(IS,I1,2) =   I
I  I  OCOST(IS,I1,2)    I
I  I   *WEIGHT(I,3)     I
I  *--------------------*
I               I
I               I
I               I
I  ***INITALIZE
I  TEMPORARY VARIABLES
I  FOR THE DEVELOPMENT
I  OF COMPOSITE
I   ***COMMERCIAL
I  VEHICLE OPERATION
I  PARAMETER ARRAY
I               I
+-------------->I
      1458      I          13
   *--------------------*
   I     TEMP1 = 0      I
   I                    I
   I     TEMP2 = 0      I
   I                    I
   I     TEMP4 = 0      I
   *--------------------*
                I
                I
                I
   ***INCREMENT THE
   COMMERCIAL VEHICLE
   WEIGHT CLASS
                I
                I<-------------
      1480      I          14
   *--------------------*
   I     I = I + 1      I
   *--------------------*
                I
                I
                I
   ***TEST FOR LAST
   VEHICLE CLASS
                I
                I
                +-------------+
```

```
+------------------->*
                     I
                     *    16
                  *     *
               *           *
            *                 *  TRUE
          *   I .GT. IWT        *------+
            *                 *
               *           *
                  *     *
                     *
                  IFALSE
                     I
                     I
                     I
                     I
                     I
   ***ACCUMULATE THE
   PERCENTAGE OF
   COMMERCIAL VEHICLES
                     I
                     I
                     I          17
   *--------------------*
   I  TEMP2 = TEMP2 +   I
   I    WEIGHT(I,2)     I
   *--------------------*
                     I
                     I
                     I
   ***BRANCH TO THE
   APPROPRIATE OPERATION
   PARAMETER
                     I
                     I
                     I          18
   *--------------------*
   I   COMPUTED GO TO   I
   I      FOR  I1       I
   *--------------------*
   I  1453       34.05  I
   I  1454       34.09  I
   I  1455       34.12  I
   I  1456       35.01  I
   *--------------------*
                     I
                     I
                     I
   IF OUTSIDE THE RANGE
                     I
                     I
                     I
   ***ACCUMULATE A
   COMPOSITE WEIGHT
   RATIO FACTOR FOR
   DEPRECIATION
                     I
    35.08--->I
      1461   I              19
   *--------------------*
   I  TEMP4 = TEMP4 +   I
   I TEMP3*WEIGHT(I,2)  I
   I   *WEIGHT(I,3)     I
   I   /WEIGHT(I,3)     I
   *--------------------*
                     I
                     I
                     I
   ***ACCUMULATE THE
   APPROPRIATE OPERATION
   PARAMETER WEIGHT
   RATIO FACTOR
                     I
    34.08*-->I
      1459   I              20
   *--------------------*
   I  TEMP1 = TEMP1 +   I
   I  RW*WEIGHT(I,2)    I
   *--------------------*
                     I
                     I
+--------------------+
```

```
+------------------->*
                     I
      1470    *    21
           *     *
        *           *
     *                 *  TRUE
   *    I1 .NE. 4        *-+
     *                 *   I
        *           *      I
           *     *         I
              *           ....
           IFALSE    . 36 .
              I      . 01 .
              I       ....
              I       1460
              I
              I
              I
   ***CONVERT THE
   MAINTENANCE COSTS FOR
   A PASSENGER CAR TO A
   COMPARABLE
    ***COSTS FOR A
   COMPOSITE COMMERCIAL
   VEHICLE AND HOLD IN
   TEMP1
              I
              I
              I          22
   *--------------------*
   I      TEMP1 =       I
   I  OCOST(IS,I1,1)    I
   I   *TEMP1/TEMP2     I
   *--------------------*
              I
              I
              I
   ***CONVERT THE
   DEPRECIATION COSTS
   FOR A PASSENGER CAR
   TO A COMPARABLE
    ***COSTS FOR A
   COMPOSITE COMMERCIAL
   VEHICLE AND HOLD IN
   TEMP2
              I
              I
              I          23
   *--------------------*
   I      TEMP2 =       I
   I  OCOST(IS,I1,2)    I
   I   *TEMP4/TEMP2     I
   *--------------------*
              I
              I
              I
   ***ADD THE
   DEPRECIATION COSTS TO
   MAINTENANCE COSTS
   ARRAY FOR PASSENGE
    ***AND ADJUST FOR
   ACTUAL PASSENGER CAR
   WEIGHT
              I
              I
              I          24
   *--------------------*
   I OCOST(IS,I1,1) =   I
   I  OCOST(IS,I1,1)    I
   I     *FACT2 +       I
   I  OCOST(IS,I1,2)    I
   *--------------------*
              I
              I
              I
   ***ESTABLISH THE
   COMPOSITE COMMERCIAL
   VEHICLE MAINTENANCE
   AND DEPRECI
    ***COSTS ARRAY
              I
              I
              I          25
   *--------------------*
   I OCOST(IS,I1,2) =   I
   I   TEMP1 + TEMP2    I
   *--------------------*
              I
              I
              I
             ...
           .     .
           .36.03.
           .     .
             ... 1451
```

```
 ***CONVERT THE
OPERATIONAL PARAMETER
FOR A PASSENGER CAR
TO A COMPARA
 ***OPERATIONAL
PARAMETER FOR A
COMPOSITE COMMERCIAL
VEHICLE

 35.21--->*
   1460    I          01
*--------------------*
I OCOST(IS,I1,2) =   I
I  OCOST(IS,I1,1)    I
I   *TEMP1/TEMP2     I
*--------------------*
          I
          I
          I
 ***FOUR KIP
PASSENGER CAR
ADJUSTED FOR ACTUAL
PASSENGER CAR WEIGHT
          I
          I
          I         02
*--------------------*
I OCOST(IS,I1,1) =   I
I  OCOST(IS,I1,1)    I
I     *FACT2         I
*--------------------*
          I
 35.25--->I
          I
   1451   *    03
        *   *
      *       *
    *           *  NO
  *   END OF DO    *-+
    *   LOOP?   *    I
      *       *      I
        *   *        I
          *        ....
          IYES     . 34 .
          I        . 03 .
          I         ....
          I
          I
          I
          I
   1450   *    04
        *   *
      *       *
    *           *  NO
  *   END OF DO    *-+
    *   LOOP?   *    I
      *       *      I
        *   *        I
          *        ....
          IYES     . 34 .
          I        . 02 .
          I         ....
          I
          I
          I
          I
 ***CONVERT THE
OPERATIONAL
PARAMETERS FROM UNITS
PER VEHICLE PER HOUR
 ***COSTS PER 1000
VEHICLES PER HOUR FOR
ALL OPERATIONAL
PARAMETERS
          I
          I
          I  NOTE  05
* * * * * * * * * * *
*   BEGIN DO LOOP    *
*  1490 IS = 1, 65   *
* * * * * * * * * * *
          I
          I
          +-------------+

+----------36.05*-->*
      A               I             06
      I   *--------------------*
      I   I  OCOSTS(IS,1) =    I
      I   I  OCOSTS(IS,1) +    I
      I   I   OCOST(IS,1,I)    I
      I   I   *FUEL(1)*1000    I
      I   I                    I
      I   I  OCOSTS(IS,1) =    I
      I   I  OCOSTS(IS,1) +    I
      I   I   OCOST(IS,2,I)    I
      I   I  *TIRES(1)*1000    I
      I   *--------------------*
                     I
                     I
                     I          07
          *--------------------*
          I  OCOSTS(IS,1) =    I
          I  OCOSTS(IS,1) +    I
          I   OCOST(IS,3,1)    I
          I   *OIL(1)*1000     I
          I                    I
          I  OCOSTS(IS,1) =    I
          I  OCOSTS(IS,1) +    I
          I   OCOST(IS,4,1)    I
          I      *1000         I
          *--------------------*
                     I
                     I
                     I          08
          *--------------------*
          I  OCOSTS(IS,2) =    I
          I  OCOSTS(IS,2) +    I
          I   OCOST(IS,1,2)    I
          I   *FUEL(2)*1000    I
          I                    I
          I  OCOSTS(IS,2) =    I
          I  OCOSTS(IS,2) +    I
          I   OCOST(IS,2,2)    I
          I  *TIRES(2)*1000    I
          *--------------------*
                     I
                     I
                     I          09
          *--------------------*
          I  OCOSTS(IS,2) =    I
          I  OCOSTS(IS,2) +    I
          I   OCOST(IS,3,2)    I
          I   *OIL(2)*1000     I
          I                    I
          I  OCOSTS(IS,2) =    I
          I  OCOSTS(IS,2) +    I
          I   OCOST(IS,4,2)    I
          I      *1000         I
          *--------------------*
                     I
                     I
                     I
            1490     *     10
                  *     *
               *           *
      I   NO *               *
      +-----*   END OF DO      *
               *   LOOP?    *
                  *      *
                     *  *
                     *
                     IYES
                     I
                     I
                     I
                     I
                     I
                     I          11
          *--------------------*
          I     TEMP1 = 0      I
          I                    I
          I     TEMP2 = 0      I
          *--------------------*
                     I
                     I
                     I  NOTE  12
          * * * * * * * * * * *
          *   BEGIN DO LOOP    *
          *  1495 I = 2, IWT   *
          * * * * * * * * * * *
                     I
                     I
                     +-------------+

+----------36.12*-->*
      A               I             13
      I   *--------------------*
      I   I  TEMP1 = TEMP1 +   I
      I   I    WEIGHT(I,1)     I
      I   I    *WEIGHT(I,2)    I
      I   I                    I
      I   I  TEMP2 = TEMP2 +   I
      I   I    WEIGHT(I,2)     I
      I   *--------------------*
                     I
                     I
                     I
            1495     *     14
                  *     *
               *           *
      I   NO *               *
      +-----*   END OF DO      *
               *   LOOP?    *
                  *      *
                     *  *
                     *
                     IYES
                     I
                     I
                     I
                     I
                     I          15
          *--------------------*
          I CWT = TEMP1/TEMP2  I
          *--------------------*
                     I
                     I
                     I 16
                 ---------
                 *  EXIT  *
                 ---------
```

```
       -----------
       / RPRINT /
       -----------
            I
 D2.05--->I
            I           01
      ----------------
     /              /
    / WRITE TO DEV /
   /      MO      /
  / VIA FORMAT   /
 /      10      /
 ----------------
            I
            I
            I           02
      ----------------
     /              /
    / WRITE TO DEV /
   /      MO      /
  / VIA FORMAT   /
 /      111     /
 ----------------
            I
            I
            I           03
      ----------------
     / WRITE TO DEV /
    /      MO      /
   / VIA FORMAT   /
  /      44      /
 / FROM THE LIST /
 ----------------
            I
            I
            I  NOTE   04
 * * * * * * * * * * *
 *   LIST = (J,J =   *
 *       1,7)        *
 * * * * * * * * * * *
            I
            I
            I           05
      ----------------
     /              /
    / WRITE TO DEV /
   /      MO      /
  / VIA FORMAT   /
 /      45      /
 ----------------
            I
            I
            I  NOTE   06
 * * * * * * * * * * *
 *  BEGIN DO LOOP    *
 * 1925 IH = 1, 24   *
 * * * * * * * * * * *
            I
+------------->I
I           I           07
I     ----------------
I     / WRITE TO DEV /
I    /      MO      /
I   / VIA FORMAT   /
I  /      107     /
I / FROM THE LIST /
I ----------------
I           I
I           I
I           I  NOTE   08
I * * * * * * * * * * *
I *    LIST = IH,     *
I * (IHOUR(IH,J),J =  *
I *       1,7)        *
I * * * * * * * * * * *
I           I
I           I
I           I
I    1925   *   09
I         *   *
I       *       *
I NO  *           *
+-----*  END OF DO  *
        *  LOOP?  *
          *     *
            * *
             *
            IYES
            I
            I
            I
            I
            +--------------+
```

```
+------------------->*
I                   I           10
I             ----------------
I            /              /
I           / WRITE TO DEV /
I          /      MO      /
I         / VIA FORMAT   /
I        /      10      /
I        ----------------
I                   I
I                   I
I                   I           11
I             ----------------
I            /              /
I           / WRITE TO DEV /
I          /      MO      /
I         / VIA FORMAT   /
I        /      112     /
I        ----------------
I                   I
I                   I
I                   I           12
I             ----------------
I            /              /
I           / WRITE TO DEV /
I          /      MO      /
I         / VIA FORMAT   /
I        /      109     /
I        ----------------
I                   I
I                   I
I                   I  NOTE   13
I        * * * * * * * * * * *
I        *  BEGIN DO LOOP    *
I        *  1980 IW = 1,     *
I        *    1000, 20       *
I        * * * * * * * * * * *
I                   I
I   +------------->I
I   I               I           14
I   I         ----------------
I   I         / WRITE TO DEV /
I   I        /      MO      /
I   I       / VIA FORMAT   /
I   I      /      108     /
I   I     / FROM THE LIST /
I   I     ----------------
I   I               I
I   I               I
I   I               I  NOTE   15
I   I    * * * * * * * * * * *
I   I    *    LIST = IW,     *
I   I    *   PATCHF(IW),     *
I   I    *   PATCHP(IW),     *
I   I    *    RLOC(IW)       *
I   I    * * * * * * * * * * *
I   I               I
I   I               I
I   I               I
I   I      1980    *    16
I   I            *   *
I   I          *       *
I   I NO     *           *
I   +-----*  END OF DO    *
I           *  LOOP?    *
I             *       *
I               *   *
I                 *
I                IYES
I                 I
I                 I
I                 I
I                 I
I                 I           17
I           ----------------
I          /              /
I         / WRITE TO DEV /
I        /      MO      /
I       / VIA FORMAT   /
I      /      10      /
I      ----------------
I                 I
I                 I
I                 I           18
I           ----------------
I          /              /
I         / WRITE TO DEV /
I        /      MO      /
I       / VIA FORMAT   /
I      /      11      /
I      ----------------
I                 I
I                 I
+                 +--------------+
```

```
+------------------->*
I                   I           19
I             ----------------
I            /              /
I           / WRITE TO DEV /
I          /      MO      /
I         / VIA FORMAT   /
I        /      12      /
I        ----------------
I                   I
I                   I
I                   I           20
I             ----------------
I             / WRITE TO DEV /
I            /      MO      /
I           / VIA FORMAT   /
I          /      13      /
I         / FROM THE LIST /
I         ----------------
I                   I
I                   I
I                   I  NOTE   21
I        * * * * * * * * * * *
I        *     LIST =        *
I        * IRDAD(J,KP),J =   *
I        *      1,2)         *
I        * * * * * * * * * * *
I                   I
I                   I
I                   I           22
I             ----------------
I             / WRITE TO DEV /
I            /      MO      /
I           / VIA FORMAT   /
I          /      14      /
I         / FROM THE LIST /
I         ----------------
I                   I
I                   I
I                   I  NOTE   23
I        * * * * * * * * * * *
I        *     LIST =        *
I        * IPAVE(ITYPE,J),   *
I        *    J = 1,3)       *
I        * * * * * * * * * * *
I                   I
I                   I
I                   I           24
I             ----------------
I             / WRITE TO DEV /
I            /      MO      /
I           / VIA FORMAT   /
I          /      15      /
I         / FROM THE LIST /
I         ----------------
I                   I
I                   I
I                   I  NOTE   25
I        * * * * * * * * * * *
I        *  LIST = PROJLN    *
I        * * * * * * * * * * *
I                   I
I                   I
I                   I           26
I             ----------------
I             / WRITE TO DEV /
I            /      MO      /
I           / VIA FORMAT   /
I          /      16      /
I         / FROM THE LIST /
I         ----------------
I                   I
I                   I
I                   I  NOTE   27
I        * * * * * * * * * * *
I        *  LIST = WIDTH     *
I        * * * * * * * * * * *
I                   I
I                   I
I                   I           28
I             ----------------
I             / WRITE TO DEV /
I            /      MO      /
I           / VIA FORMAT   /
I          /      17      /
I         / FROM THE LIST /
I         ----------------
I                   I
I                   I
I                   I  NOTE   29
I        * * * * * * * * * * *
I        *  LIST = NYEARS    *
I        * * * * * * * * * * *
I                   I
I                   I
+                   +--------------+
```

```
+------------------->*
I                   I           30
I             ----------------
I             / WRITE TO DEV /
I            /      MO      /
I           / VIA FORMAT   /
I          /      18      /
I         / FROM THE LIST /
I         ----------------
I                   I
I                   I
I                   I  NOTE   31
I        * * * * * * * * * * *
I        *  LIST = OLIFE     *
I        * * * * * * * * * * *
I                   I
I                   I
I                   I           32
I             ----------------
I             / WRITE TO DEV /
I            /      MO      /
I           / VIA FORMAT   /
I          /      19      /
I         / FROM THE LIST /
I         ----------------
I                   I
I                   I
I                   I  NOTE   33
I        * * * * * * * * * * *
I        *  LIST = RLIFE     *
I        * * * * * * * * * * *
I                   I
I                   I
I                   I           34
I             ----------------
I             / WRITE TO DEV /
I            /      MO      /
I           / VIA FORMAT   /
I          /      20      /
I         / FROM THE LIST /
I         ----------------
I                   I
I                   I
I                   I  NOTE   35
I        * * * * * * * * * * *
I        *  LIST = PSIRS     *
I        * * * * * * * * * * *
I                   I
I                   I
I                   I           36
I             ----------------
I            /              /
I           / WRITE TO DEV /
I          /      MO      /
I         / VIA FORMAT   /
I        /      21      /
I        ----------------
I                   I
I                   I
I                   I           37
I        *--------------------*
I        I     ITEST =        I
I        I  (VOLUME(1) +      I
I        I VOLUME(2))*1000    I
I        *--------------------*
I                   I
I                   I
I                   I           38
I             ----------------
I             / WRITE TO DEV /
I            /      MO      /
I           / VIA FORMAT   /
I          /      22      /
I         / FROM THE LIST /
I         ----------------
I                   I
I                   I
I                   I  NOTE   39
I        * * * * * * * * * * *
I        *  LIST = ITEST     *
I        * * * * * * * * * * *
I                   I
I                   I
I                   I           40
I        *--------------------*
I        I     TEMP1 =        I
I        I   TRUCKS(1) +      I
I        I    TRUCKS(2)       I
I        *--------------------*
I                   I
I                   I
I                   I
I                   I /
I                 -----
I                /40.01
```

```
39.40--->*
         I           01
   ----------------
  / WRITE TU DEV  /
 /      MO       /
/  VIA FORMAT   /
/     23       /
/ FROM THE LIST /
----------------
         I
         I
         I  NOTE  02
* * * * * * * * * * *
*   LIST = TEMP1    *
* * * * * * * * * * *
         I
         I
         I           03
*--------------------*
I     TEMP2 =        I
I    SPLIT(1) +      I
I     SPLIT(2)       I
*--------------------*
         I
         I
         I           04
   ----------------
  / WRITE TO DEV  /
 /      MO       /
/  VIA FORMAT   /
/     24       /
/ FROM THE LIST /
----------------
         I
         I
         I  NOTE  05
* * * * * * * * * * *
*   LIST = TEMP2    *
* * * * * * * * * * *
         I
         I
         I           06
*--------------------*
I  ITEST = ITEST +   I
I     VOLUME(2)      I
I    *(NYEARS -      I
I      1)*1000       I
*--------------------*
         I
         I
         I           07
   ----------------
  / WRITE TO DEV  /
 /      MO       /
/  VIA FORMAT   /
/     25       /
/ FROM THE LIST /
----------------
         I
         I
         I  NOTE  08
* * * * * * * * * * *
*   LIST = ITEST    *
* * * * * * * * * * *
         I
         I
         I           09
*--------------------*
I  TEMP1 = TEMP1 +   I
I     TRUCKS(2)      I
I   *(NYEARS - 1)    I
*--------------------*
         I
         I
         I           10
   ----------------
  / WRITE TO DEV  /
 /      MO       /
/  VIA FORMAT   /
/     26       /
/ FROM THE LIST /
----------------
         I
         I
         I  NOTE  11
* * * * * * * * * * *
*   LIST = TEMP1    *
* * * * * * * * * * *
         I
         I
         +-------------+
```

```
+------------------>*
                    I            12
*--------------------*
I  TEMP2 = TEMP2 +   I
I     SPLIT(2)       I
I  *INYEARS - 1)     I
*--------------------*
         I
         I
         I           13
   ----------------
  / WRITE TO UEV  /
 /      MO       /
/  VIA FORMAT   /
/     27       /
/ FROM THE LIST /
----------------
         I
         I
         I  NOTE  14
* * * * * * * * * * *
*   LIST = TEMP2    *
* * * * * * * * * * *
         I
         I
         I           15
*--------------------*
I   I = LANES + 1    I
I                    I
I     TEMP1 =        I
I   CAP(I)*1000      I
*--------------------*
         I
         I
         I           16
   ----------------
  / WRITE TO DEV  /
 /      MO       /
/  VIA FORMAT   /
/     28       /
/ FROM THE LIST /
----------------
         I
         I
         I  NOTE  17
* * * * * * * * * * *
*   LIST = TEMP1    *
* * * * * * * * * * *
         I
         I
         I           18
*--------------------*
I     TEMP1 =        I
I   CAP(1)*1000      I
*--------------------*
         I
         I
         I           19
   ----------------
  / WRITE TO DEV  /
 /      MO       /
/  VIA FORMAT   /
/     29       /
/ FROM THE LIST /
----------------
         I
         I
         I  NOTE  20
* * * * * * * * * * *
*   LIST = TEMP1    *
* * * * * * * * * * *
         I
         I
         I           21
*--------------------*
I  COMPUTEU GO TO    I
I     FOR  KP        I
*--------------------*
I  1900      40.29   I
*--------------------*
         I
         I
         I
IF OUTSIDE THE RANGE
         I
         I           22
*--------------------*
I     TEMP1 =        I
I   CAP(2)*1000      I
*--------------------*
         I
         I
         +-------------+
```

```
+------------------>*
                    I            23
   ----------------
  / WRITE TO DEV  /
 /      MO       /
/  VIA FORMAT   /
/     30       /
/ FROM THE LIST /
----------------
         I
         I
         I  NOTE  24
* * * * * * * * * * *
*   LIST = TEMP1    *
* * * * * * * * * * *
         I
         I
         I           25
*--------------------*
I  COMPUTED GO TO    I
I     FOR  KP        I
*--------------------*
I  1900      40.29   I
I  1900      40.29   I
*--------------------*
         I
         I
         I
IF OUTSIDE THE RANGE
         I
         I
         I           26
*--------------------*
I     TEMP1 =        I
I   CAP(3)*1000      I
*--------------------*
         I
         I
         I           27
   ----------------
  / WRITE TO DEV  /
 /      MO       /
/  VIA FORMAT   /
/     31       /
/ FROM THE LIST /
----------------
         I
         I
         I  NOTE  28
* * * * * * * * * * *
*   LIST = TEMP1    *
* * * * * * * * * * *
         I
 40.21*-->I
   1900   I  NOTE  29
* * * * * * * * * * *
*     CONTINUE      *
* * * * * * * * * * *
         I
         I
         I           30
*--------------------*
I     TEMP1 =        I
I  CAP(LANES)*1000   I
*--------------------*
         I
         I
         I           31
   ----------------
  / WRITE TO DEV  /
 /      MO       /
/  VIA FORMAT   /
/     82       /
/ FROM THE LIST /
----------------
         I
         I
         I  NOTE  32
* * * * * * * * * * *
*   LIST = TEMP1    *
* * * * * * * * * * *
         I
         I
         I           33
*--------------------*
I     TEMP1 =        I
I  DETOUR(5)*1000    I
*--------------------*
         I
         I
         +-------------+
```

```
+------------------>*
                    I            34
   ----------------
  / WRITE TO DEV  /
 /      MO       /
/  VIA FORMAT   /
/     83       /
/ FROM THE LIST /
----------------
         I
         I
         I  NOTE  35
* * * * * * * * * * *
*   LIST = TEMP1    *
* * * * * * * * * * *
         I
         I
         I           36
   ----------------
  / WRITE TO DEV  /
 /      MO       /
/  VIA FORMAT   /
/     95       /
/ FROM THE LIST /
----------------
         I
         I
         I  NOTE  37
* * * * * * * * * * *
* LIST = DETOUR(1)  *
* * * * * * * * * * *
         I
         I
         I           38
   ----------------
  / WRITE TO DEV  /
 /      MO       /
/  VIA FORMAT   /
/     96       /
/ FROM THE LIST /
----------------
         I
         I
         I  NOTE  39
* * * * * * * * * * *
* LIST = DETOUR(2)  *
* * * * * * * * * * *
         I
         I
         I           40
   ----------------
  / WRITE TO DEV  /
 /      MO       /
/  VIA FORMAT   /
/     97       /
/ FROM THE LIST /
----------------
         I
         I
         I  NOTE  41
* * * * * * * * * * *
* LIST = DETOUR(3)  *
* * * * * * * * * * *
         I
         I
         I           42
   ----------------
  / WRITE TO DEV  /
 /      MO       /
/  VIA FORMAT   /
/     98       /
/ FROM THE LIST /
----------------
         I
         I
         I  NOTE  43
* * * * * * * * * * *
* LIST = DETOUR(4)  *
* * * * * * * * * * *
         I
         I
         I           44
   ----------------
  / WRITE TO DEV  /
 /      MO       /
/  VIA FORMAT   /
/     100      /
/ FROM THE LIST /
----------------
         I
         I
         I
         I /
        -----
       /41.01
```

```
 40.44--->*
          I  NOTE  01
* * * * * * * * * * *
* LIST = DETOUR(6)  *
* * * * * * * * * * *
          I
          I
          I        02
  ----------------
 / WRITE TO DEV  /
/     MO        /
/  VIA FORMAT   /
/    101        /
/ FROM THE LIST /
----------------
          I
          I
          I  NOTE  03
* * * * * * * * * * *
* LIST = DETOUR(7)  *
* * * * * * * * * * *
          I
          I
          I        04
  ----------------
 / WRITE TO DEV  /
/     MO        /
/  VIA FORMAT   /
/    106        /
/ FROM THE LIST /
----------------
          I
          I
          I  NOTE  05
* * * * * * * * * * *
*     LIST =        *
* SLIMIT(LANES + 1) *
* * * * * * * * * * *
          I
          I
          I        06
  ----------------
 / WRITE TO DEV  /
/     MO        /
/  VIA FORMAT   /
/    102        /
/ FROM THE LIST /
----------------
          I
          I
          I  NOTE  07
* * * * * * * * * * *
* LIST = SLIMIT(1)  *
* * * * * * * * * * *
          I
          I
          I        08
  ----------------
 / WRITE TO DEV  /
/     MO        /
/  VIA FORMAT   /
/    103        /
/ FROM THE LIST /
----------------
          I
          I
          I  NOTE  09
* * * * * * * * * * *
* LIST = SLIMIT(2)  *
* * * * * * * * * * *
          I
          I
          I        10
  ----------------
 / WRITE TO DEV  /
/     MO        /
/  VIA FORMAT   /
/    104        /
/ FROM THE LIST /
----------------
          I
          I
          I  NOTE  11
* * * * * * * * * * *
* LIST = SLIMIT(3)  *
* * * * * * * * * * *
          I
          I
          +-------------+
```

```
+------------------>*
          I        12
  ----------------
 / WRITE TO DEV  /
/     MO        /
/  VIA FORMAT   /
/    105        /
/ FROM THE LIST /
----------------
          I
          I
          I  NOTE  13
* * * * * * * * * * *
* LIST = SLIMIT(4)  *
* * * * * * * * * * *
          I
          I
          I        14
  ----------------
 / WRITE TO DEV  /
/     MO        /
/  VIA FORMAT   /
/    33         /
/ FROM THE LIST /
----------------
          I
          I  NOTE  15
* * * * * * * * * * *
*    LIST = CWT     *
* * * * * * * * * * *
          I
          I
          I        16
*--------------------*
I      ITEST =       I
I   ARHO*1000000     I
*--------------------*
          I
          I
          I        17
  ----------------
 / WRITE TO DEV  /
/     MO        /
/  VIA FORMAT   /
/    34         /
/ FROM THE LIST /
----------------
          I
          I
          I  NOTE  18
* * * * * * * * * * *
*   LIST = ITEST    *
* * * * * * * * * * *
          I
          I
          I        19
  ----------------
 /               /
/ WRITE TO DEV  /
/     MO        /
/  VIA FORMAT   /
/    10         /
----------------
          I
          I
          I        20
  ----------------
 /               /
/ WRITE TO DEV  /
/     MO        /
/  VIA FORMAT   /
/    113        /
----------------
          I
          I
          I        21
*--------------------*
I   N = LANES + 1    I
*--------------------*
          I
          I
          I        22
  ----------------
 / WRITE TO DEV  /
/     MO        /
/  VIA FORMAT   /
/    88         /
/ FROM THE LIST /
----------------
          I
          I
          +-------------+
```

```
+------------------>*
          I  NOTE  23
* * * * * * * * * * *
*   LIST = (J,J =   *
*      1,N)         *
* * * * * * * * * * *
          I
          I
          I        24
  ----------------
 /               /
/ WRITE TO DEV  /
/     MO        /
/  VIA FORMAT   /
/    87         /
----------------
          I
          I
          I  NOTE  25
* * * * * * * * * * *
*  BEGIN DO LOOP    *
*  1950 I = 1, 11   *
* * * * * * * * * * *
          I
+----------->I
I            I        26
I  *--------------------*
I  I  VC = (I - 1)*.1  I
I  *--------------------*
I            I
I            I
I    1950    I        27
I     ----------------
I    / WRITE TO DEV  /
I   /     MO        /
I  /  VIA FORMAT   /
I /    110        /
I/ FROM THE LIST /
I----------------
I            I
I            I  NOTE  28
I * * * * * * * * * * *
I *   LIST = VC,      *
I * (SP(J,I),J = 1,N) *
I * * * * * * * * * * *
I            I
I            I
I            I
I            *   29
I          *   *
I        *       *
I NO   *           *
+-----*  END OF DO   *
        *  LOOP?   *
          *      *
            *  *
             *
             IYES
             I
             I
             I
             I
             I        30
  ----------------
 /               /
/ WRITE TO DEV  /
/     MO        /
/  VIA FORMAT   /
/    10         /
----------------
          I
          I
          I        31
  ----------------
 /               /
/ WRITE TO DEV  /
/     MO        /
/  VIA FORMAT   /
/    35         /
----------------
          I
          I
          I        32
  ----------------
 /               /
/ WRITE TO DEV  /
/     MO        /
/  VIA FORMAT   /
/    36         /
----------------
          I
          I
          +-------------+
```

```
+------------------>*
          I        33
  ----------------
 /               /
/ WRITE TO DEV  /
/     MO        /
/  VIA FORMAT   /
/    37         /
----------------
          I
          I
          I        34
  ----------------
 /               /
/ WRITE TO DEV  /
/     MO        /
/  VIA FORMAT   /
/    38         /
----------------
          I
          I
          I        35
  ----------------
 /               /
/ WRITE TO DEV  /
/     MO        /
/  VIA FORMAT   /
/    39         /
----------------
          I
          I
          I  NOTE  36
* * * * * * * * * * *
*  BEGIN DO LOOP    *
*  1910 IH = 1, 24  *
* * * * * * * * * * *
          I
+----------->I
I            I        37
I     ----------------
I    / WRITE TO DEV  /
I   /     MO        /
I  /  VIA FORMAT   /
I /    40         /
I/ FROM THE LIST /
I----------------
I            I
I            I  NOTE  38
I * * * * * * * * * * *
I *    LIST = IH,       *
I * (PCTAOT(IH,J,1,1)  *
I *    ,J = 1,7),      *
I * (PCTAOT(IH,J,2,1)  *
I *    ,J = 1,7)       *
I * * * * * * * * * * *
I            I
I            I
I    1910    *   39
I          *   *
I        *       *
I NO   *           *
+-----*  END OF DO   *
        *  LOOP?   *
          *      *
            *  *
             *
             IYES
             I
             I
             I
             I
             I        40
  ----------------
 /               /
/ WRITE TO DEV  /
/     MO        /
/  VIA FORMAT   /
/    41         /
----------------
          I
          I
          I  NOTE  41
* * * * * * * * * * *
*  BEGIN DO LOOP    *
*  1911 IH = 1, 24  *
* * * * * * * * * * *
          I
          I
          I  /
        -----
        /42.01
```

```
+----41.41*-->*
I             I          01
I      ----------------
I      / WRITE TO DEV /
I     /      MO      /
I    /  VIA FORMAT  /
I   /      40      /
I  / FROM THE LIST /
I  ----------------
I             I
I             I
I             I   NOTE  02
I  * * * * * * * * * * *
I  *    LIST = IH,      *
I  * IPCTADT(IH,J,1,2)  *
I  *    ,J = 1,7),      *
I  * (PCTADT(IH,J,2,2)  *
I  *     ,J = 1,7)      *
I  * * * * * * * * * * *
I             I
I             I
I             I
I     1911    *    03
I          *     *
I       *           *
I  NO *               *
+-----*   END OF DO    *
        *   LOOP?    *
          *        *
             *  *
              *
              IYES
              I
              I
              I
              I
              I          04
          ----------------
         /              /
        / WRITE TO DEV /
       /      MO      /
      /  VIA FORMAT  /
     /      10      /
     ----------------
              I
              I
              I          05
          ----------------
         /              /
        / WRITE TO DEV /
       /      MO      /
      /  VIA FORMAT  /
     /      11      /
     ----------------
              I
              I
              I          06
          ----------------
         /              /
        / WRITE TO DEV /
       /      MO      /
      /  VIA FORMAT  /
     /      42      /
     ----------------
              I
              I
              I          07
          ----------------
         /              /
        / WRITE TO DEV /
       /      MO      /
      /  VIA FORMAT  /
     /      43      /
     ----------------
              I
              I
              I          08
          ----------------
         / WRITE TO DEV /
        /      MO      /
       /  VIA FORMAT  /
      /      44      /
     / FROM THE LIST /
     ----------------
              I
              I
              I   NOTE  09
     * * * * * * * * * * *
     *   LIST = IJ,J =   *
     *       1,7)        *
     * * * * * * * * * * *
              I
              I
              +--------------+
```

```
+------------------->*
I             I          10
I      ----------------
I     /              /
I    / WRITE TO DEV /
I   /      MO      /
I  /  VIA FORMAT  /
I /      45      /
I ----------------
I             I
I             I
I             I          11
I      ----------------
I     / WRITE TO DEV /
I    /      MO      /
I   /  VIA FORMAT  /
I  /      46      /
I / FROM THE LIST /
I ----------------
I             I
I             I
I             I   NOTE  12
I * * * * * * * * * * *
I *     LIST =        *
I *  (OVER(2,J),J =   *
I *       1,7)        *
I * * * * * * * * * * *
I             I
I             I
I             I          13
I      ----------------
I     / WRITE TO DEV /
I    /      MO      /
I   /  VIA FORMAT  /
I  /      47      /
I / FROM THE LIST /
I ----------------
I             I
I             I
I             I   NOTE  14
I * * * * * * * * * * *
I *     LIST =        *
I *  (OVER(3,J),J =   *
I *       1,7)        *
I * * * * * * * * * * *
I             I
I             I
I             I          15
I      ----------------
I     / WRITE TO DEV /
I    /      MO      /
I   /  VIA FORMAT  /
I  /      48      /
I / FROM THE LIST /
I ----------------
I             I
I             I
I             I   NOTE  16
I * * * * * * * * * * *
I *     LIST =        *
I *   (SWORK(J),J =   *
I *       1,7)        *
I * * * * * * * * * * *
I             I
I             I
I             I          17
I      ----------------
I     / WRITE TO DEV /
I    /      MO      /
I   /  VIA FORMAT  /
I  /      49      /
I / FROM THE LIST /
I ----------------
I             I
I             I
I             I   NOTE  18
I * * * * * * * * * * *
I *     LIST =        *
I *  (OVER(4,J),J =   *
I *       1,7)        *
I * * * * * * * * * * *
I             I
I             I
I             I          19
I      ----------------
I     / WRITE TO DEV /
I    /      MO      /
I   /  VIA FORMAT  /
I  /      50      /
I / FROM THE LIST /
I ----------------
I             I
I             I
+             +--------------+
```

```
+------------------->*
I             I   NOTE  20
I * * * * * * * * * * *
I *     LIST =        *
I *  (OVER(6,J),J =   *
I *       1,7)        *
I * * * * * * * * * * *
I             I
I             I
I             I          21
I      ----------------
I     / WRITE TO DEV /
I    /      MO      /
I   /  VIA FORMAT  /
I  /      51      /
I / FROM THE LIST /
I ----------------
I             I
I             I
I             I   NOTE  22
I * * * * * * * * * * *
I *     LIST =        *
I *  (OVER(5,J),J =   *
I *       1,7)        *
I * * * * * * * * * * *
I             I
I             I
I             I          23
I      ----------------
I     / WRITE TO DEV /
I    /      MO      /
I   /  VIA FORMAT  /
I  /      52      /
I / FROM THE LIST /
I ----------------
I             I
I             I
I             I   NOTE  24
I * * * * * * * * * * *
I *     LIST =        *
I *  (OVER(7,J),J =   *
I *       1,7)        *
I * * * * * * * * * * *
I             I
I             I
I             I          25
I      ----------------
I     / WRITE TO DEV /
I    /      MO      /
I   /  VIA FORMAT  /
I  /      53      /
I / FROM THE LIST /
I ----------------
I             I
I             I
I             I   NOTE  26
I * * * * * * * * * * *
I *     LIST =        *
I *  (OVER(8,J),J =   *
I *       1,7)        *
I * * * * * * * * * * *
I             I
I             I
I             I          27
I      ----------------
I     / WRITE TO DEV /
I    /      MO      /
I   /  VIA FORMAT  /
I  /      54      /
I / FROM THE LIST /
I ----------------
I             I
I             I
I             I   NOTE  28
I * * * * * * * * * * *
I *     LIST =        *
I *  (OVER(9,J),J =   *
I *       1,7)        *
I * * * * * * * * * * *
I             I
I             I
I             I          29
I      ----------------
I     / WRITE TO DEV /
I    /      MO      /
I   /  VIA FORMAT  /
I  /      55      /
I / FROM THE LIST /
I ----------------
I             I
I             I
+             +--------------+
```

```
+------------------->*
I             I   NOTE  30
I * * * * * * * * * * *
I *     LIST =        *
I *  (OVER(11,J),J =  *
I *       1,7)        *
I * * * * * * * * * * *
I             I
I             I
I             I          31
I      ----------------
I     / WRITE TO DEV /
I    /      MO      /
I   /  VIA FORMAT  /
I  /      56      /
I / FROM THE LIST /
I ----------------
I             I
I             I
I             I   NOTE  32
I * * * * * * * * * * *
I *     LIST =        *
I *  (OVER(1,J),J =   *
I *       1,7)        *
I * * * * * * * * * * *
I             I
I             I
I             I          33
I      ----------------
I     / WRITE TO DEV /
I    /      MO      /
I   /  VIA FORMAT  /
I  /      57      /
I / FROM THE LIST /
I ----------------
I             I
I             I
I             I   NOTE  34
I * * * * * * * * * * *
I *     LIST =        *
I *  (OVER(10,J),J =  *
I *       1,7)        *
I * * * * * * * * * * *
I             I
I             I
I             I          35
I      ----------------
I     / WRITE TO DEV /
I    /      MO      /
I   /  VIA FORMAT  /
I  /      89      /
I / FROM THE LIST /
I ----------------
I             I
I             I
I             I   NOTE  36
I * * * * * * * * * * *
I *     LIST =        *
I * (OVER(12,IA),IA = *
I *       1,7)        *
I * * * * * * * * * * *
I             I
I             I
I             I          37
I      ----------------
I     / WRITE TO DEV /
I    /      MO      /
I   /  VIA FORMAT  /
I  /      90      /
I / FROM THE LIST /
I ----------------
I             I
I             I
I             I   NOTE  38
I * * * * * * * * * * *
I *     LIST =        *
I *  (SIMI(IA,1),IA = *
I *       1,7)        *
I * * * * * * * * * * *
I             I
I             I
I             I          39
I      ----------------
I     / WRITE TO DEV /
I    /      MO      /
I   /  VIA FORMAT  /
I  /      91      /
I / FROM THE LIST /
I ----------------
I             I
I             I
I             I
I             I  /
+             -----
             /43.01
```

```
42.39--->*
          I NOTE 01
* * * * * * * * * * *
*      LIST =       *
*  (SIM(IA,2),IA =  *
*       1,7)        *
* * * * * * * * * * *
          I
          I 02
    / WRITE TO DEV /
    /      MO      /
    /  VIA FORMAT  /
    /      92      /
    / FROM THE LIST /
          I
          I NOTE 03
* * * * * * * * * * *
*      LIST =       *
*  (SIM(IA,3),IA =  *
*       1,7)        *
* * * * * * * * * * *
          I
          I 04
    / WRITE TO DEV /
    /      MO      /
    /  VIA FORMAT  /
    /      93      /
    / FROM THE LIST /
          I
          I NOTE 05
* * * * * * * * * * *
*      LIST =       *
*  (SIM(IA,4),IA =  *
*       1,7)        *
* * * * * * * * * * *
          I
          I 06
    / WRITE TO DEV /
    /      MO      /
    /  VIA FORMAT  /
    /      94      /
    / FROM THE LIST /
          I
          I NOTE 07
* * * * * * * * * * *
*      LIST =       *
*  (SIM(IA,5),IA =  *
*       1,7)        *
* * * * * * * * * * *
          I
          I 08
    / WRITE TO DEV /
    /      MO      /
    /  VIA FORMAT  /
    /      58      /
          I
          I 09
    / WRITE TO DEV /
    /      MO      /
    /  VIA FORMAT  /
    /      59      /
    / FROM THE LIST /
          I
          I NOTE 10
* * * * * * * * * * *
*  LIST = TCMOVE    *
* * * * * * * * * * *
          I
          +------------->*
          I 11
    / WRITE TO DEV /
    /      MO      /
    /  VIA FORMAT  /
    /      60      /
    / FROM THE LIST /
          I
          I NOTE 12
* * * * * * * * * * *
*   LIST = WALK     *
* * * * * * * * * * *
          I
          I 13
    / WRITE TO DEV /
    /      MO      /
    /  VIA FORMAT  /
    /      61      /
          I
          I 14
    / WRITE TO DEV /
    /      MO      /
    /  VIA FORMAT  /
    /      62      /
          I
          I 15
    / WRITE TO DEV /
    /      MO      /
    /  VIA FORMAT  /
    /      63      /
          I
          I 16
    / WRITE TO DEV /
    /      MO      /
    /  VIA FORMAT  /
    /      64      /
          I
          I NOTE 17
* * * * * * * * * * *
*  BEGIN DO LOOP    *
*  1920 IA = 1, 7   *
* * * * * * * * * * *
          I
          I<------------
          I 18
    / WRITE TO DEV /
    /      MO      /
    /  VIA FORMAT  /
    /      65      /
    / FROM THE LIST /
          I
          I NOTE 19
* * * * * * * * * * *
*    LIST = IA,     *
*  (PS(IA,1,J),J =  *
*       1,3),       *
*  (PS(IA,2,J),J =  *
*       1,3),       *
*  (PS(IA,3,J),J =  *
*       1,3)        *
* * * * * * * * * * *
          I
          +------------->*
          I
   1920   *   20
        *   *
NO    *       *
+---* END OF DO *
      * LOOP? *
        *   *
          *
          IYES
          I 21
    / WRITE TO DEV /
    /      MO      /
    /  VIA FORMAT  /
    /      10      /
          I
          I 22
    / WRITE TO DEV /
    /      MO      /
    /  VIA FORMAT  /
    /      66      /
          I
          I 23
    / WRITE TO DEV /
    /      MO      /
    /  VIA FORMAT  /
    /      67      /
          I
          I 24
    / WRITE TO DEV /
    /      MO      /
    /  VIA FORMAT  /
    /      68      /
          I
          I 25
    / WRITE TO DEV /
    /      MO      /
    /  VIA FORMAT  /
    /      69      /
    / FROM THE LIST /
          I
          I NOTE 26
* * * * * * * * * * *
* LIST = FUEL(1),   *
* OIL(1), TIRES(1)  *
* * * * * * * * * * *
          I
          I 27
    / WRITE TO DEV /
    /      MO      /
    /  VIA FORMAT  /
    /      70      /
    / FROM THE LIST /
          I
          I NOTE 28
* * * * * * * * * * *
* LIST = FUEL(2),   *
* OIL(2), TIRES(2)  *
* * * * * * * * * * *
          I
          +------------->*
          I 29
    / WRITE TO DEV /
    /      MO      /
    /  VIA FORMAT  /
    /      71      /
          I
          I 30
    / WRITE TO DEV /
    /      MO      /
    /  VIA FORMAT  /
    /      72      /
          I
          I 31
    / WRITE TO DEV /
    /      MO      /
    /  VIA FORMAT  /
    /      73      /
          I
          I 32
    / WRITE TO DEV /
    /      MO      /
    /  VIA FORMAT  /
    /      74      /
          I
          I NOTE 33
* * * * * * * * * * *
*  BEGIN DO LOOP    *
*  1930 I = 1, 32   *
* * * * * * * * * * *
          I
+--------->I
          I 34
*-------------------*
I    IS = I + 32    I
*-------------------*
          I
          I 35
    / WRITE TO DEV /
    /      MO      /
    /  VIA FORMAT  /
    /      75      /
    / FROM THE LIST /
          I
          I NOTE 36
* * * * * * * * * * *
*    LIST = I,      *
* (OCOSTS(I,J),J =  *
*    1,2), IS,      *
* (OCOSTS(IS,J),J = *
*       1,2)        *
* * * * * * * * * * *
          I
   1930   *   37
        *   *
NO    *       *
+---* END OF DO *
      * LOOP? *
        *   *
          *
          IYES
          I /
        -----
        /44.01
```

```
 43.37--->*
          I          01
     ----------------
    /               /
   / WRITE TO DEV  /
  /      MO       /
 /  VIA FORMAT   /
/      10       /
----------------
          I
          I
          I          02
     ----------------
    /               /
   / WRITE TO DEV  /
  /      MO       /
 /  VIA FORMAT   /
/      66       /
----------------
          I
          I              +------------------->*
          I          03  I                    I          11
     ----------------    I               ----------------
    / WRITE TO DEV  /    I              /               /
   /      MO       /     I             / WRITE TO DEV  /
  /  VIA FORMAT   /      I            /      MO       /
 /      84       /       I           /  VIA FORMAT   /
/ FROM THE LIST /        I          /      78       /
----------------         I          ----------------
          I              I                    I
          I              I                    I
          I  NOTE    04  I                    I          12
* * * * * * * * * * * *  I               ----------------
*     LIST = INC      *  I              /               /
* * * * * * * * * * * *  I             / WRITE TO DEV  /
          I              I            /      MO       /
          I              I           /  VIA FORMAT   /
          I          05  I          /      79       /
     ----------------    I          ----------------
    / WRITE TO DEV  /    I                    I
   /      MO       /     I                    I
  /  VIA FORMAT   /      I                    I          13
 /      85       /       I               ----------------
/ FROM THE LIST /        I              /               /
----------------         I             / WRITE TO DEV  /
          I              I            /      MO       /
          I              I           /  VIA FORMAT   /
          I  NOTE    06  I          /      80       /
* * * * * * * * * * * *  I          ----------------
*    LIST = DCWORK    *  I                    I
* * * * * * * * * * * *  I                    I
          I              I                    I  NOTE    14
          I              I          * * * * * * * * * * * *
          I          07  I          *   BEGIN DO LOOP     *
     ----------------    I          *   1940 I = 1, 20    *
    / WRITE TO DEV  /    I          * * * * * * * * * * * *
   /      MO       /     I                    I
  /  VIA FORMAT   /      I        +---------->I
 /      86       /       I        I           I          15
/ FROM THE LIST /        I        I  *--------------------*
----------------         I        I  I    IT = I + 20     I
          I              I        I  *--------------------*
          I              I        I           I
          I  NOTE    08  I        I           I
* * * * * * * * * * * *  I        I           I          16
*    LIST = DCSCHL    *  I        I      ----------------
* * * * * * * * * * * *  I        I     / WRITE TO DEV  /
          I              I        I    /      MO       /
          I              I        I   /  VIA FORMAT   /
          I          09  I        I  /      81       /
     ----------------    I        I / FROM THE LIST /
    /               /    I        I ----------------
   / WRITE TO DEV  /     I        I           I
  /      MO       /      I        I           I
 /  VIA FORMAT   /       I        I           I  NOTE    17
/      76       /        I        I  * * * * * * * * * * * *
----------------         I        I  *     LIST = I,        *
          I              I        I  * (VTRATE(J,I),J =     *
          I              I        I  *     1,5), IT,        *
          I          10  I        I  * (VTRATE(J,IT),J =    *
     ----------------    I        I  *       1,5)           *
    /               /    I        I  * * * * * * * * * * * *
   / WRITE TO DEV  /     I        I           I
  /      MO       /      I        I           I
 /  VIA FORMAT   /       I        I           I
/      77       /        I        I     1940  *    18
----------------         I        I          *   *
          I              I        I        *       *
          I              I        I  NO  *           *
          +--------------+        +-----*  END OF DO    *
                                         *   LOOP?   *
                                           *       *
                                             *   *
                                              *
                                              IYES
                                              I
                                              I
                                              I
                                              I
                                              I
                                              I 19
                                          ---------
                                          *  EXIT  *
                                          ---------
```

```
                 -----------
                /   YEAR   /
               -----------
                    I
        02.07--->I
                    I  NOTE  01
           * * * * * * * * * * *
           *   BEGIN 00 LOOP   *
           *   2001 I = 1, 6   *
           * * * * * * * * * * *
                    I
   +------------>I
   I                I              02
   I      *--------------------*
   I      I   TOTALA(I) = 0   I
   I      *--------------------*
   I                I
   I                I
   I                I
   I       2001    *     03
   I             *   *
   I          *         *
   I  NO   *               *
   +-----*     ENO OF 00      *
             *    LOOP?    *
               *         *
                  *   *
                    *
                    IYES
                    I
                    I
                    I
                    I
                    I
                    I              04
          *--------------------*
          I   PSIASN = 4.5     I
          I                    I
          I     RAGE = 0       I
          I                    I
          I    AAXLES = 0      I
          *--------------------*
                    I
                    I
                    I
           ***THIS ANALYSIS IS
          PERFORMEO FOR NYEARS
                    I
                    I
                    I  NOTE  05
          * * * * * * * * * * *
          *    BEGIN 00 LOOP   *
          *    2000 IY = 1,    *
          *       NYEARS       *
          * * * * * * * * * * *
                    I
          60.08--->I
                    I
          **  INCREMENT VOLUME
          FOR EACH YEAR
                    I
                    I
                    I              06
          *--------------------*
          I    VOLUME(I) =     I
          I    VOLUME(1) +     I
          I     VOLUME(2)      I
          *--------------------*
                    I
                    I
                    I
          **  INCREMENT %
          COMMERCIAL FOR EACH
          YEAR
                    I
                    I
                    I              07
          *--------------------*
          I    TRUCKS(1) =     I
          I    TRUCKS(1) +     I
          I     TRUCKS(2)      I
          *--------------------*
                    I
                    I
                    I
          **  INCREMENT AM ANO
          PM OIRECTIONAL SPLIT
          FOR EACH YEAR
                    I
                    I
                    I              08
          *--------------------*
          I    SPLIT(1) =      I
          I    SPLIT(I) +      I
          I     SPLIT(2)       I
          *--------------------*
                    I
                    I
                    +-------------+
```

```
+------------------->*
                      I  NOTE  09
          * * * * * * * * * * *
          *   BEGIN 00 LOOP   *
          *   2010 IO = 1, 2  *
          * * * * * * * * * * *
                      I
          50.04--->I
                      I  NOTE  10
          * * * * * * * * * * *
          *   BEGIN 00 LOOP   *
          *   2011 IT = 1, 7  *
          * * * * * * * * * * *
                      I
          50.03--->I
                      I  NOTE  11
          * * * * * * * * * * *
          *   BEGIN 00 LOOP   *
          *   2012 IH = 1, 24 *
          * * * * * * * * * * *
                      I
  +------------->I
  I                   I
  I   **  INCREMENT
  I   OISTRIBUTION OF
  I   TRAFFIC FOR EACH YEAR
  I                   I
  I                   I
  I                   I              12
  I   *--------------------*
  I   I PCTAOT(IH,IT,IO,   I
  I   I        1) =        I
  I   I PCTAOT(IH,IT,IO,   I
  I   I        1) +        I
  I   I PCTAOT(IH,IT,IO,   I
  I   I        2)          I
  I   *--------------------*
  I                   I
  I                   I
  I                   I
  I       2012      *     13
  I               *   *
  I            *         *
  I   NO    *               *
  +-----*     ENO OF 00      *
               *    LOOP?    *
                 *         *
                    *   *
                      *
                      IYES
                      I
                      I
                      I
                      I
                      I
                      I              14
          *--------------------*
          I   N = LANES + 1   I
          *--------------------*
                      I
                      I
                      I  NOTE  15
          * * * * * * * * * * *
          *   BEGIN 00 LOOP   *
          *   2020 IC = 1, N  *
          * * * * * * * * * * *
                      I
          50.02--->I
                      I  NOTE  16
          * * * * * * * * * * *
          *   BEGIN 00 LOOP   *
          *   2021 I = 1, 8   *
          * * * * * * * * * * *
                      I
          50.01--->I
                      I
          **  INITIALIZE COSTS
          TO ZERO FOR EACH YEAR
                      I
                      I
                      I              17
          *--------------------*
          I COSTS(IT,IC,I,IO) I
          I        = 0         I
          *--------------------*
                      I
                      I
                      I
                      I  /
                     -----
                    /50.01
```

```
49.17--->*
2021   *   01
   END OF DO LOOP?   NO   .49.  .17.
   IYES
2020   *   02
   END OF DO LOOP?   NO   .49.  .16.
   IYES
2011   *   03
   END OF DO LOOP?   NO   .49.  .11.
   IYES
2010   *   04
   END OF DO LOOP?   NO   .49.  .10.
   IYES
SUBROUTINE AWORKL
***NOTE: OPTION TO TRANSFER
***     1. PSI VALUE,'PSI' OR
***     2. ACCUMULATED 18 KIP AXLES,'AXLE'

***DETERMINE THE PSI AND ANALYSIS AGE FOR YEAR

***INITIALIZE THE PRESENT SERVICEABILITY INDEX TO ZERO EACH YEAR

                 05
I      PSI = 0       I

***TEST TO DETERMINE IF A PSI HAS BEEN TRANSFERED FROM A CALLING PROG
        *   06
   PSI .EQ. 0   TRUE
   IFALSE
   .51.01.
   ... 2349

***INITIALIZE THE TRANSFER ACCUMULATED 18 KIP VARIABLE TO ZERO
2310   I          07
I      AXLE = 0       I

***TEST TO DETERMINE IF 'AXLE' HAS BEEN TRANSFERED FROM A CALLING PRO
        *   08
   AXLE .EQ. 0   TRUE
   IFALSE

***ASSIGN TRANSFERED VALUE FOR AXLE TO VARIABLE FOR ACCUMULATED 18 KI
                 09
I    AAXLES = AXLE    I

***DETERMINE THE DAILY COMMERCIAL TRAFFIC VOLUME FOR ANALYSIS YEAR
2320   I          10
I      CVOL =
I      TRUCKS(1)
I   *VOLUME(1)/100

***DETERMINE THE ANNUAL COMMERCIAL TRAFFIC 18 KIP AXLE LOADINGS
                  11
I AAXLES = AAXLES +
I CVOL*.365*.735/2

***ANALYSIS AGE IS EQUAL TO ANAYSIS YEAR MINUS PAVEMENT RESURFACED YE
2323   I          12
I  AGE = IY - RAGE  I

***TEST THE PREDICTED ACCUMULATED AXLES AGAINIST ACTUAL ACCUMULATED A
        *   13
   AGE*ARHO .GT. AAXLES   TRUE
   IFALSE

***BASE ANALYSIS AGE ON ACTUAL AXLES
                  14
I AGE = AAXLES/ARHO I

***COMPUTE PSI,PSIASN=INITIAL PSI, DLIFE=DESIGN LIFE,AGE=ANALYSIS AGE
2326   I          15
I  PSI = PSIASN -
I    (((PSIASN -
I  1.5)/DLIFE)*AGE)
   /51.01
```

```
50.06*-->*
  2349   I  NOTE  01
* * * * * * * * * * *
*     CONTINUE      *
* * * * * * * * * * *

***ANALYSIS AGE IS
ASSUMED RELATED TO
LINEAR LOSS IN PSI
OVER 20 YEAR

                     02
*-------------------*
I     AGE =         I
I   20*(PSIASN -    I
I   PSI)/(PSIASN -  I
I      1.5)         I
*-------------------*

***TEST PSI TO
DETERMINE IF PAVEMENT
SHOULD BE RESURFACED
 ***IF PAVEMENT IS
DUE FOR RESURFACING
SET MAINTENANCE LEVEL
EQUAL TO

          *  03
FALSE *        *
+-----*  PSI .LE.   *
      *   PSIRS   *
          *
          ITRUE
                     04
*-------------------*
I   OVER(6,7) = 1   I
*-------------------*
+------------->I

***DEVELOPMENT OF
ANNUAL WORKLOAD FOR
ACTIVITIES

***DETERMINE THE
TYPE OF
ROADWAY,CONCRETE,
BITUMINOUS OR
COMPOSITE
                     05
*-------------------*
I   COMPUTED GO TO  I
I     FOR  ITYPE    I
*-------------------*
I  2101      51.06  I
I  2102      52.11  I
I  2103      53.08  I
*-------------------*

IF OUTSIDE THE RANGE

**CONCRETE WORKLOAD
ANALYSIS

51.05--->I
  2101   I  NOTE  06
* * * * * * * * * * *
*     CONTINUE      *
* * * * * * * * * * *
```

```
***GET EACH ACTIVITY
             I  NOTE  07
* * * * * * * * * * *
*   BEGIN DO LOOP   *
*  2104 IA = 1, 7   *
* * * * * * * * * * *

52.10--->I
***INITIALIZE WORK A
TEMPORARY VARIABLE TO
HOLD ANNUAL WORKLOAD
BY AC
                     08
*-------------------*
I     WORK = 0      I
*-------------------*

***TEST TO SEE IF
MAINTENANCE LEVEL IS
ZERO MEANING NO
WORKLOAD

          *  09
                *  TRUE
*  OVER(6,IA)   *-+
 *   .EQ. 0   *   I
          *      ....
          IFALSE . 52 .
                 . 10 .
                  ....
                  2104

***BRANCH TO THE
APPROPRIATE ACTIVITY
MODEL
                     10
*-------------------*
I   COMPUTED GO TO  I
I      FOR  IA      I
*-------------------*
I  2120      51.11  I
I  2125      51.12  I
I  2130      52.01  I
I  2135      52.04  I
I  2140      52.05  I
I  2108      52.07  I
I  2195      54.11  I
*-------------------*

IF OUTSIDE THE RANGE

***FULL DEPTH
CONCRETE PATCHING
MODEL

51.10--->I
  2120   I           11
*-------------------*
I      WORK =       I
I    OVER(3,IA)     I
I    *34*(1/(1 +    I
I  EXP(-1*((AGE -   I
I   10)/1.25))))    I
*-------------------*
         ...
       .52.07.
         ... 2108
```

```
***PARTIAL DEPTH
CONCRETE PATCHING

51.10--->*
  2125   I           12
*-------------------*
I  WORK = HWORK(1)  I
*-------------------*

***IT IS ASSUMED
THAT PARTIAL DEPTH
PATCHING CANNOT
EXCEED ONE CUBIC

          *  13
FALSE *        *
+-----*  WORK .GT. 1  *
          *
          ITRUE
                     14
*-------------------*
I     WORK = 1      I
*-------------------*
+------------->I

***DEDUCT PARTIAL
DEPTH PATCHING FROM
ACCUMULATED FULL
DEPTH PATCHING
                     15
*-------------------*
I     HWORK(1) =    I
I  HWORK(1) - WORK  I
*-------------------*

***FACTOR WORKLOAD
IF APPLICABLE
                     16
*-------------------*
I      WORK =       I
I  WORK*OVER(3,IA)  I
*-------------------*

***TEST FOR OVERRIDE
WORKLOAD RATE

          *  17
                *  FALSE
*  OVER(4,IA)   *-----+
 *   .NE. 0   *       I
          *           I
          ITRUE       I
                      +----------51.17*-->*
                      A
                     18
*-------------------*
I WORK = OVER(4,IA) I
*-------------------*
          +-----------+
```

```
51.17*-->*
***CONVERT PARTIAL
PATCHING TO SQUARE
FEET AND ACCUMULATE
                     19
*-------------------*
I   HWORK(IA) =     I
I   HWORK(IA) +     I
I     WORK*9        I
*-------------------*
         ...
       .52.10.
         ... 2104
```

```
***CONCRETE BLOWUPS

***ASSUMED THAT
THERE ARE NO BLOWUPS
PRIOR TO FIFTH YEAR

51.10--->*
         I
  2130   *    01
       *    *
     *        *
   *            *  TRUE
 *   IY .LT. 5    *-----+
   *            *       I
     *        *         I
       *    *           I
          *             I
          IFALSE        I
          I             I

***IT IS ASSUMED         I
THAT THERE WILL BE NO    I
BLOWUPS AFTER 25         I
YEARS                    I
          I              I
          *    02        I
       *    *            I
     *        *          I
   *            *  TRUE  I
 *   IY .GT. 25   *---->I
   *            *        I
     *        *          I
       *    *            I
          *              I
          IFALSE         I
          I              I

***BLOWUP MODEL FOR      I
BETWEEN 5 AND 25         I
YEARS                    I
          I              I
  2131    I        03    I
*--------------------*   I
I WORK = .005*(IY -  I   I
I   4)*OVER(3,IA)    I   I
*--------------------*   I
          I              I
          +--------------I-----+
                         I
                         +----------51.09*-->I

***JOINT SEALING
MODEL

51.10--->*
  2135    I        04
*--------------------*
I      WORK =        I
I  5280/OVER(2,IA)   I
I *WIDTH*OVER(6,IA)  I
I    *OVER(3,IA)     I
*--------------------*
          I
          ...
       .52.07.
          ... 2108


***TEMP3 IS THE
PORTION OF THE TOTAL
MUDJACKING TO BE DONE
EACH YEAR

51.10--->*
  2140    I           05
*---------------------*
I       TEMP3 =       I
I    .25*(.5*IY)      I
I  **2*EXP(-.5*IY)    I
*---------------------*
          I

***ANNUAL MUDJACKING
LOCATIONS
          I           06
*--------------------*
I      WORK =        I
I  TEMP3*52.8/OVER   I
I (2,IA)*OVER(3,IA)  I
*--------------------*
          I

***OVER RIDE
WORKLOAD RATE FOR ANY
ACTIVITY
          I
+----51.10*-->I
          I
  2108    *    07
       *    *
     *        *
   *            *  FALSE
 *   OVER(4,IA)   *-----+
   *  .NE. 0    *       I
     *        *         I
       *    *           I
          *             I
          ITRUE         I
          I        08   I
*--------------------*  I
I WORK = OVER(4,IA)  I  I
*--------------------*  I
          I             I
          I<------------+
          I

***ACCUMULATED
WORKLOAD FOR ANY
ACTIVITY
          I        09
*--------------------*
I    HWORK(IA) =     I
I HWORK(IA) + WORK   I
*--------------------*
          I
----------51.09*-->I
          I
  2104    *    10
       *    *
     *        *
   *            *  NO
 *   END OF DO    *-+
   *   LOOP?    *   I
     *        *     I
       *    *       ....
          *       . 51 .
          IYES    . 08 .
          I        ....
          ...
       .54.15.
          ... 2199


***BITUMINOUS
WORKLOAD ANALYSIS

51.05--->*
  2102    I   NOTE  11
* * * * * * * * * * *
*      CONTINUE     *
* * * * * * * * * * *
          I

***GET EACH ACTIVITY
          I
          I   NOTE  12
* * * * * * * * * * *
*   BEGIN DO LOOP   *
*  2105 IA = 1, 7   *
* * * * * * * * * * *
          I
53.07--->I
          I

***INITIALIZE WORK A
TEMPORARY VARIABLE TO
HOLD ANNUAL WORKLOAD
BY AC
          I           13
*--------------------*
I      WORK = 0      I
*--------------------*
          I

***TEST TO SEE IF
MAINTENANCE LEVEL IS
ZERO MEANING NO
WORKOAD
          I
          *    14
       *    *
     *        *
   *            *  TRUE
 *   OVER(6,IA)   *-+
   *  .EQ. 0    *   I
     *        *     I
       *    *       I
          *        ....
          IFALSE  . 53 .
          I       . 07 .
          I        ....
          I        2105

***BITUMINOUS
WORKLOAD AGE FACTOR
MODEL
          I           15
*--------------------*
I FACT1 = (1/(1 +    I
I   EXP((-AGE +      I
I   10)/1.16)))      I
*--------------------*
          I

***BRANCH TO THE
APPROPRIATE ACTIVITY
MODEL
          I           16
*--------------------*   +------------------>*
I  COMPUTED GO TO    I   I                   I
I      FOR  IA       I   I   IF OUTSIDE THE RANGE
*--------------------*   I                   I
I  2150        52.17 I   I
I  2155        53.01 I   I        ***BITUMINOUS
I  2160        53.02 I   I        PATCHING WORKLOAD
I  2109        53.03 I   I                   I
I  2109        53.03 I   I        52.16--->I
I  2109        53.03 I   I          2150     I           17
I  2195        54.11 I   I        *--------------------*
*--------------------*   I        I      WORK =        I
          I              I        I FACT1*1100*OVER    I
          I              I        I      (3,IA)        I
          +--------------+        *--------------------*
                                             I
                                             ...
                                          .53.03.
                                             ... 2109
```

```
 ***CRACKSEALING
WORKLOAD

 52.16--->*
   2155    I         01
*--------------------*
I      WORK =        I
I  FACT1*1000*OVER   I
I      (3,IA)        I
*--------------------*
           I
           I
           +-------------+
                         A

 ***BITUMINOUS BASE
AND SURFACE REPAIR
WORKLOAD

 52.16--->*
   2160    I         02
*--------------------*
I      WORK =        I
I FACT1*OVER(3,IA)   I
I       *5           I
*--------------------*
           I
           I
           +-------------+
```

```
                  -----------
                  /  2109   /
                  -----------
                       I
+----------52.16*-->I
I                      I  NOTE  03
I           * * * * * * * * * * *
I           *     CONTINUE      *
I           * * * * * * * * * * *
I                      I
I                      I
I                      I
I            ***OVER RIDE
I           WORKLOAD RATE FOR ANY
I           ACTIVITY
I                      I
I                      I
I                      I
A                      *    04
I                   *     *
I                *           *
I        FALSE *                *
I        +-----*  OVER(4,IA)      *
I        I        *  .NE. 0    *
I        I           *       *
I        I              *  *
I        I               *
I        I              ITRUE
I        I               I
I        I               I
I        I               I
I        I               I
I        I               I          05
I        I    *--------------------*
I        I    I WORK = OVER(4,IA)  I
I        I    *--------------------*
I        I               I
I        +-------------->I
I                        I
I             ***ACCUMULATED
I            WORKLOAD FOR ANY
I            ACTIVITY
I                        I
I                        I
I                        I          06
I            *--------------------*
I            I    HWORK(IA) =     I
I            I HWORK(IA) + WORK   I
I            *--------------------*
                         I
               52.14--->I
                         I
               2105   *    07
                   *     *
                *           *
             *                 *   NO
           *    END OF DO       *-+
             *    LOOP?      *    I
                *           *     I
                   *     *        I
                      *          ....
                     IYES       . 52 .
                      I         . 13 .
                      I          ....
                      I
                      I
                      I
                      I
                     ...
                   .     .
                   .54.15.
                   .     .
                     ... 2199
```

```
 ***COMPOSITE
WORKLOAD ANALYSIS

 51.05--->*
   2103    I  NOTE  08
* * * * * * * * * * * *
*       CONTINUE       *
* * * * * * * * * * * *
           I
           I
           I         09
*--------------------*
I  FACT1 = (1/(1 +   I
I    EXP((-AGE +     I
I    10)/1.16)))     I
*--------------------*
           I
           I
           I
 ***GET EACH ACTIVITY
           I
           I
           I  NOTE  10
* * * * * * * * * * * *
*    BEGIN DO LOOP     *
*  2106 IA = 1, 7      *
* * * * * * * * * * * *
           I
 54.10--->I
           I
 ***INITIALIZE WORK A
TEMPORARY VARIABLE TO
HOLD ANNUAL WORKLOAD
BY AC
           I
           I
           I          11
*--------------------*
I      WORK = 0      I
*--------------------*
           I
           I
           I
 ***TEST TO SEE IF
MAINTENANCE LEVEL IS
ZERO MEANING NO
WORKLOAD
           I
           I
           I
           *    12
        *     *
     *           *
   *                *   TRUE
 *    OVER(6,IA)      *-+
   *   .EQ. 0      *    I
      *          *      I
         *    *         I
           *           ....
          IFALSE     . 54 .
           I         . 10 .
           I          ....
           I          2106
           I
           I
           I
 ***BRANCH TO THE
APPROPRIATE ACTIVITY
MODEL
           I
           I
           I         13
*--------------------*
I  COMPUTED GO TO    I
I      FOR  IA       I
*--------------------*
I  2170      53.15   I
I  2110      54.07   I
I  2180      54.01   I
I  2185      54.04   I
I  2190      54.05   I
I  2110      54.07   I
I  2195      54.11   I  +------------------->*
*--------------------*  I                    I
           I            I         ***OVERLAY PATCHING
           I            I        MODEL
           I            I                    I
IF OUTSIDE THE RANGE    I         53.13--->I
           I            I          2170    I          15
           I            I        *--------------------*
           +------------+        I      WORK =        I
                                 I  FACT1*1100*OVER   I
                                 I      (3,IA)        I
                                 *--------------------*
                                            I
                                            I
                                            I
                                           ...
                                         .     .
                                         .54.07.
                                         .     .
                                           ... 2110
```

```
***OVERLAY BLOWUP
MODEL

***ASSUMED THAT
THERE ARE NO BLOWUPS
PRIOR TO FIFTH YEAR

 53.13--->*
          I
  2130    *    01
        *   *
      *       *
    *           *  TRUE
  *   IY .LT. 5   *--+
    *           *    I
      *       *      I
        *   *        I
          *         ....
          IFALSE . 54 .
          I       . 10 .
          I        ....
          I        2106
          I
          I
          I
***IT IS ASSUMED
THAT THERE WIL BE NO
BLOWUPS AFTER 25
YEARS
          I
          I
          I
          *    02
        *   *
      *       *
    *           *  TRUE
  *  IY .GT. 25   *--+
    *           *    I
      *       *      I
        *   *        I
          *         ....
          IFALSE . 54 .
          I       . 10 .
          I        ....
          I        2106
          I
          I
          I
***BLOWUP MODEL FOR
BETWEEN 5 AND 25
YEARS
          I
          I
  2181    I            03
*--------------------*
I WORK = .005*(IY -  I
I   4)*OVER(3,IA)    I
*--------------------*
          I
          I
          I
         ...
       .     .
      .54.07.
       .     .
         ... 2110

***CRACKSEALING
MODEL

 53.13--->*
  2185    I            04
*--------------------*
I       WORK =       I
I  FACT1*1000*OVER   I
I      (3,IA)        I
*--------------------*
          I
          I
          I
         ...
       .     .
      .54.07.
       .     .
         ... 2110
```

```
***TEMP3 IS THE
PORTION OF THE TOTAL
MUDJACKING TO BE DONE
EACH YEAR

 53.13--->*
  2190    I            05
*--------------------*
I      TEMP3 =       I
I   .25*(.5*IY)      I
I  **2*EXP(-.5*IY)   I
*--------------------*
          I
          I
          I
***ANNUAL MUDJACKING
LOCATIONS
          I
          I
          I            06
*--------------------*
I      WORK =        I
I  TEMP3*52.8/OVER   I
I (2,IA)*OVER(3,IA)  I
*--------------------*
          I
          I
          +--------------+
```

```
***OVER RIDE
WORKLOAD RATE FOR ANY
ACTIVITY
+-----------53.13*-->*
I                    I
I            2110    *    07
I                  *   *
I                *       *
I     FALSE *              *
I     +-----*   OVER(4,IA)   *
I     I       *   .NE. 0   *
I     I         *        *
I     I           *    *
I     I              *
I     I              ITRUE
I     I              I
I     I              I
I     I              I
I     I              I
I     I              I            08
I     I  *--------------------*
I     I  I WORK = OVER(4,IA)  I
I     I  *--------------------*
I     I              I
I     +------------->I
+-----+              I
***ACCUMULATED
WORKLOAD FOR ANY
ACTIVITY
                     I
                     I
                     I            09
         *--------------------*
         I    HWORK(IA) =     I
         I HWORK(IA) + WORK   I
         *--------------------*
                     I
         53.12*-->I
                     I
            2106     *    10
                   *   *
                 *       *
               *           *  NO
             *  END OF DO    *--+
               *  LOOP?    *    I
                 *       *      I
                   *   *        I
                     *         ....    +----------52.10*-->I
                     IYES     . 53 .   I
                     I        . 11 .   I
                     I         ....    I
                     I                 I
                     I                 I
                     I                 I
                     +-----------------+
```

```
***SET RAGE, THE
YEAR OF PAVEMENT
RESURFACING,EQUAL TO
ANALYSIS YEAR

 51.10*-->*
  2195    I            11
*--------------------*
I     RAGE = IY      I
*--------------------*
          I
          I
          I
***COMPUTE
RESURFACING WORKLOAD
          I
          I
          I            12
*--------------------*
I    HWORK(IA) =     I
I   586.67*WIDTH*    I
I    OVER(3,IA)      I
*--------------------*
          I
          I
          I
***SET ACCUMULATED
18 KIP AXLES EQUAL TO
ZERO
          I
          I
          I            13
*--------------------*
I    AAXLES = 0      I
*--------------------*
          I
          I
          I
***RESET DESIGN LIFE
TO RLIFE, THE
RESURFACED DESIGN
LIFE
          I
          I
          I            14
*--------------------*
I   DLIFE = RLIFE    I
*--------------------*
          I
----------52.10*-->I
  2199    I   NOTE  15
* * * * * * * * * * *
*     CONTINUE      *
* * * * * * * * * * *
          I
          I
          I
RETURN
END
          I
          I
          I
***THIS IS A ROUTINE
AT THE DIRECTION
LEVEL
          I
          I
          I   NOTE  16
* * * * * * * * * * *
*   BEGIN DO LOOP   *
*  2030 ID = 1, 2   *
* * * * * * * * * * *
          I
 55.17--->I
          I
***INITIALIZE TEMP1
FOR EXCESS VOLUME TO
ZERO
          I
          I
          I            17
*--------------------*
I     TEMP1 = 0      I
*--------------------*
          I
          I
          I   NOTE  18
* * * * * * * * * * *
*   BEGIN DO LOOP   *
*  2031 IH = 1, 24  *
* * * * * * * * * * *
          I
          I
          I
          I  /
        -----
       /55.01
```

```
 54.18*-->*
          I
 ***DETERMINE THE
 HOURLY TRAFFIC
 VOLUME ON THE FREEWAY
          I
          I
          I            01
 *-------------------*
 I    HVOL(IH) =     I
 I     VOLUME(1)     I
 I    *ABS(ID - 1 -  I
 I    SPLIT(1)/100)  I
 I *PCTADT(IH,7,ID,  I
 I    1) + TEMP1     I
 *-------------------*
          I
          I
          I
 ***DETERMINE NORMAL
 FREEWAY CAPACITY
          I
          I
          I            02
 *-------------------*
 I    CAPACT =       I
 I    CAPILANES +    I
 I      1)*I1 -      I
 I PCTADT(IH,6,ID,1) I
 I         )         I
 *-------------------*
          I
          I
          I
 ***TEST TO DETERMINE
 IF HOURLY VOLUME
 EXCEEDS NORMAL
 CAPACITY
 ***AND IF IT DOES
 HOLD EXCESS IN TEMP1
          I
          I
          I
          *   03
        *   *
      *       *
 FALSE *         *
+-----* HVOL(IH) .GT. *
I       *  CAPACT   *
I         *       *
I           *   *
I             *
I             ITRUE
I             I
I             I
I             I
I             I
I             I            04
I  *-------------------*
I  I     TEMP1 =       I
I  I HVOL(IH) - CAPACT I
I  *-------------------*
I             I
+------------>I
 ***LET THE HOURLY
 NORMAL VOLUME BE THE
 ACTUAL VOLUME LESS
 TEMP1
          I
          I
          I            05
 *-------------------*
 I    HVOL(IH) =     I
 I HVOL(IH) - TEMP1  I
 *-------------------*
          I
          I
          I
 ***DETERMIN V/C
 SUBSCRIPT
          I
          I
          I            06
 *-------------------*
 I       I =         I
 I    (HVOL(IH)      I
 I /CAPACT + .15)*10 I
 *-------------------*
          I
          I
          +-------------+
```

```
+------------------->*
                     I
  ***ASSIGN A SPEED TO
  THE HOUR
                     I
                     I
                     I            07
 *-------------------*
 I   SPEEON(IH) =    I
 I  SPILANES + 1,I)  I
 *-------------------*
                     I
                     I
                     I
 ***DETERMINE THE
 HOURLY TRAFFIC VOLUME
 ON THE DETOUR
                     I
                     I
                     I            08
 *-------------------*
 I    DVOL(IH) =     I
 I     HVOL(IH)      I
 I    *DETOUR(4)     I
 I    /VOLUME(1)     I
 *-------------------*
                     I
                     I
                     I
 ***DETERMINE NORMAL
 DETOUR CAPACTITY
                     I
                     I
                     I            09
 *-------------------*
 I     CAPACT =      I
 I  DETOUR(5)*I1 -   I
 I PCTADT(IH,6,ID,1) I
 I         )         I
 *-------------------*
                     I
                     I
                     I
 ***DETERMINE  V/C
 SUBSCRIPT
                     I
                     I
                     I            10
 *-------------------*
 I        I =        I
 I     (DVOL(IH)     I
 I /CAPACT + .15)*10 I
 *-------------------*
                     I
                     I
                     I
 ***SUBSCRIPT CANNOT
 EXCEED ELEVEN
                     I
                     I
                     *   11
                   *   *
                 *       *
 FALSE *              *
+-----*   I .GT. 11    *
I        *           *
I          *       *
I            *   *
I              *
I              ITRUE
I              I
I              I
I              I
I              I
I              I            12
I  *-------------------*
I  I      I = 11       I
I  *-------------------*
I              I
+------------->I
                     I
  ***ASSIGN A SPEED TO
  THE HOUR FOR DETOUR
                     I
                     I
                     I            13
 *-------------------*
 I   SPEEDD(IH) =    I
 I    SPILANES,I)    I
 *-------------------*
                     I
                     I
                     +-------------+
```

```
+------------------->*
                     I
   2031   *   14
        *   *
      *       *
    *           *   NO
  *   END OF DO   *-+
    *   LOOP?   *   I
      *       *     I
        *   *       I
          *       ....
          IYES    . 55 .
          I       . 01 .
          I       ....
          I
          I
          I
          I            15
 *-------------------*
 I6 I                H
 I4 I     MAINT      H
 I. I                H
 ID I                H
 I1 I                H
 *-------------------*
          I
          I
          I            16
 *-------------------*
 I7 I                H
 I5 I     MOTOR      H
 I. I                H
 ID I                H
 I1 I                H
 *-------------------*
          I
          I
          I
   2030   *   17
        *   *
      *       *
    *           *   NO
  *   END OF DO   *-+
    *   LOOP?   *   I
      *       *     I
        *   *       I
          *       ....
          IYES    . 54 .
          I       . 17 .
          I       ....
          I
          I
          I
          I
 ***TEST FOR
 RESURFACED ROADWAY
          I
          I
          I
          *   18
        *   *
      *       *
    *           *   TRUE
  *   OVER(6,7)   *-+
    *  .NE. 1   *   I
      *       *     I
        *   *       I
          *       ....
          IFALSE  . 56 .
          I       . 03 .
          I       ....
          I       2040
          I
          I
 ***SET MAINTENANCE
 LEVEL EQUAL TO ZERO
          I
          I
          I            19
 *-------------------*
 I   OVER(6,7) = 0   I
 *-------------------*
          I
          I
          I
 ***RESET THE INITAIL
 PSI TO 3.6 , THIS IS
 80% OF THE NEW
 PAVEMENT VAL
          I
          I
          +-------------+
```

```
+------------------->*
                     I            21
 *-------------------*
 I   PSIASN = 3.6    I
 *-------------------*
          I
          I
          I  NOTE   22
 * * * * * * * * * * *
 *   BEGIN DO LOOP   *
 *  2035 IA = 1, 7   *
 * * * * * * * * * * *
          I
+----------->I
I            I            23
I  *-------------------*
I  I   HWORK(IA) = 0   I
I  *-------------------*
I            I
I            I
I   2035     *   24
I          *   *
I        *       *
I NO   *           *
+-----*   END OF DO   *
        *   LOOP?   *
          *       *
            *   *
              *
              IYES
              I
              I
              I
              I
              I
              I
              *   25
            *   *
          *       *
        *           *   TRUE
      *  ITYPE .NE. 1  *-+
        *           *    I
          *       *      I
            *   *        I
              *        ....
              IFALSE   . 56 .
              I        . 03 .
              I        ....
              I        2040
              I
              I
              I
 ***MAKE THE
 FOLLOWING CONVERSIONS
 FOR CONCRETE PAVEMENT
 ***TO REFLECT THAT
 PAVEMENT TYPE IS NOW
 COMPOSITE
          I
          I
          I
 ***COMPOSITE
 PAVEMENT IS ITYPE=3
          I
          I
          I            26
 *-------------------*
 I     ITYPE = 3     I
 *-------------------*
          I
          I
          I
 ***SET THE
 MAINTENANCE LEVEL FOR
 PARTIAL DEPTH
 PARTCHING TO ZERO
          I
          I
          I            27
 *-------------------*
 I   OVER(6,2) = 0   I
 *-------------------*
          I
          I
          I
 ***SET THE
 SIMULATION FACTOR TO
 TEN FOR BITUMINOUS
 PATCHING
          I
          I
          I
          I  /
        -----
       /56.01
```

```
55.28--->*
         I               01
*--------------------*
I   SIM(1,2) = 10    I
*--------------------*
***SET THE
MAINTENANCE LEVEL FOR
JOINT SEALING TO
ANNUAL
         I               02
*--------------------*
I   OVER(6,4) = 1    I
*--------------------*
55.18*-->I
  2040   I  NOTE  03
*     CONTINUE       *
***THIS IS A ROUTINE
TO COMPUTE
ACCUMULATED ACCIDENTS
AND POLLUTION
         I               04
*--------------------*
I   N = LANES + 1    I
*--------------------*
         I  NOTE  05
*   BEGIN DO LOOP    *
*   2050 ID = 1, 2   *
56.11--->I
         I  NOTE  06
*   BEGIN DO LOOP    *
*   2051 IC = 1, N   *
         I  NOTE  07
*   BEGIN DO LOOP    *
*   2052 IA = 1, 7   *
         I               08
*--------------------*
I COSTS(IA,IC,4,IO)  I
I         =          I
I COSTS(IA,IC,3,IO)  I
I    *100/AACOST     I
I                    I
I COSTS(IA,IC,7,IO)  I
I         =          I
I COSTS(IA,IC,7,ID)  I
I  *100/(VOLUME(1)   I
I     *PROJLN)       I
*--------------------*
   2052  *    09
NO  *  END OF DO LOOP?  *
         IYES
```

```
   2051  *    10
NO  *  END OF DO LOOP?  *
         IYES
   2050  *    11
*  END OF DO LOOP?  *-+ NO
         IYES   . 56 .
                . 06 .
SUBROUTINE PRINT
         I  NOTE  12
*   BEGIN DO LOOP    *
*   5100 I = 1, 8    *
56.20--->I
         I  NOTE  13
*   BEGIN DO LOOP    *
*   5101 IO = 1, 2   *
         I               14
*--------------------*
I   N = LANES + 1    I
*--------------------*
         I  NOTE  15
*   BEGIN DO LOOP    *
*   5102 IC = 1, N   *
         I               16
*--------------------*
I ITOTAL(IC,I,IO) =  I
I         0          I
*--------------------*
   5102  *    17
NO  *  END OF DO LOOP?  *
         IYES
```

```
   5101  *    18
NO  *  END OF DO LOOP?  *
         IYES
         I               19
*--------------------*
I   TOTALY(I) = 0    I
*--------------------*
   5100  *    20
*  END OF DO LOOP?  *-+ NO
         IYES   . 56 .
                . 13 .
         I  NOTE  21
*   BEGIN DO LOOP    *
*   5110 IO = 1, 2   *
57.06--->I
         I  NOTE  22
*   BEGIN DO LOOP    *
*   5111 IA = 1, 7   *
57.05--->I
         I               23
*--------------------*
I       I = 1        I
I                    I
I   N = LANES + 1    I
*--------------------*
***ACCUMULATE TOTAL
COST BY ACTIVITY AND
CLOSURE AND
***ACCUMULATE TOTALS
FOR EACH COST ITEM BY
CLOSURE
         I  NOTE  24
*   BEGIN DO LOOP    *
*   5112 IC = 1, N   *
57.01--->I
         I               25
*--------------------*
I COSTS(IA,IC,8,ID)  I
I         =          I
I COSTS(IA,IC,5,IO)  I
*--------------------*
         I  NOTE  26
*   BEGIN DO LOOP    *
*   5113 K = 1, 3    *
```

```
----------56.26*-->*
A        I               27
*--------------------*
I COSTS(IA,IC,8,IO)  I
I         =          I
I COSTS(IA,IC,8,IO)  I
I         +          I
I COSTS(IA,IC,K,IO)  I
I                    I
I ITOTAL(IC,K,IO) =  I
I ITOTAL(IC,K,ID) +  I
I COSTS(IA,IC,K,IO)  I
*--------------------*
   5113  *    28
NO  *  END OF DO LOOP?  *
         IYES
         I  NOTE  29
*   BEGIN DO LOOP    *
*   5114 K = 4, 8    *
+------------>I
         I               30
*--------------------*
I ITOTAL(IC,K,IO) =  I
I ITOTAL(IC,K,ID) +  I
I COSTS(IA,IC,K,IO)  I
*--------------------*
   5114  *    31
NO  *  END OF DO LOOP?  *
         IYES
***HOLD LANE CLOSURE
SUBSCRIPT FOR MINIMUM
COST
         *    32
* COSTS(IA, * FALSE
* IC,8,IO) .LT. *-+
*COSTS(IA,I,*
 * 8,IO) *
         ITRUE  . 57 .
                . 01 .
         I               33
*--------------------*
I       I = IC       I
*--------------------*
         I  /
       -----
       /57.01
```

```
56.32*-->*
         I
 5112    *    01
       *   *
     *       *
   *           *  NO
 *   END OF DO   *-+
   *  LOOP?    *   I
     *       *     I
       *   *       I
         *     ....
         IYES  . 56 .
         I     . 25 .
         I     ....
         I
         I
         I
         I
***ACCUMULATE AND
HOLD MINIMUM COST
         I
         I
         I  NOTE  02
* * * * * * * * * * *
*   BEGIN DO LOOP   *
*   5115 K = 1, 8   *
* * * * * * * * * * *
         I
------------>I
         I            03
*-------------------*
I    TOTALY(K) =    I
I    TOTALY(K) +    I
I COSTS(IA,I,K,ID)  I
*-------------------*
         I
         I
         I
 5115    *    04
       *   *
     *       *
NO *           *
-----*  END OF DO  *
   *  LOOP?    *
     *       *
       *   *
         *
         IYES
         I
         I
         I
         I
         I
         I
 5111    *    05
       *   *
     *       *
   *           *  NO
 *   END OF DO   *-+
   *  LOOP?    *   I
     *       *     I
       *   *       I
         *     ....
         IYES  . 56 .
         I     . 23 .
         I     ....
         I
         I
         I
         I
 5110    *    06
       *   *
     *       *
   *           *  NO
 *   END OF DO   *-+
   *  LOOP?    *   I
     *       *     I
       *   *       I
         *     ....
         IYES  . 56 .
         I     . 22 .
         I     ....
         I
         I
         I
         I
***TEST FOR PRINT
LEVEL
***      1. DIRECTION
DETAIL
***      2. YEAR
DETAIL
***      3. YEAR
SUMMARY
         I
         I
         +--------------+
```

```
+------------------>*
                    I
***      4. ANALYSIS
SUMMARY
                    I
                    I
                    I          08
*--------------------*
I  COMPUTED GO TO    I
I    FOR  IPRINT     I
*--------------------*
I  5010       57.09  I
I  5020       58.04  I
I  5000       59.01  I
I  5000       59.01  I
*--------------------*
                    I
                    I
                    I
IF OUTSIDE THE RANGE
                    I
                    I
                    I
***DIRECTION DETAIL
PRINT ROUTINE
                    I
57.08--->I
   5010    I   NOTE  09
* * * * * * * * * * *
*     CONTINUE      *
* * * * * * * * * * *
                    I
                    I
                    I  NOTE  10
* * * * * * * * * * *
*   BEGIN DO LOOP   *
*  5011 ID = 1, 2   *
* * * * * * * * * * *
                    I
58.03--->I
                    I          11
*--------------------*
I      IP1 = 0       I
*--------------------*
                    I
                    I
. 5014              I          12
        ----------------
       /                /
      / WRITE TO DEV   /
     /      MO        /
    /  VIA FORMAT    /
   /      101       /
   ----------------
                    I
                    I
                    I          13
        ----------------
       / WRITE TO DEV  /
      /      MO       /
     /  VIA FORMAT   /
    /      102      /
   / FROM THE LIST /
   ----------------
                    I
                    I
                    I  NOTE  14
* * * * * * * * * * *
*     LIST = IY,    *
* (DIRECT(J,ID),J = *
*       1,2)        *
* * * * * * * * * * *
                    I
                    I
                    I
                    *    15
                  *   *
                *       *
              *           * FALSE
            *  ID .GT. 2    *-----+
              *           *       A
                *       *
                  *   *
                    *
                    ITRUE
                    I
                    I
                    I
                    I
                    I          16
*--------------------*
I      ID = 1        I
*--------------------*
                    I
                    I
                    +--------------+
```

```
+-----------57.15*-->*
                     I          17
        ----------------
       /                /
      / WRITE TO DEV   /
     /      MO        /
    /  VIA FORMAT    /
   /      103       /
   ----------------
                     I
                     I
                     I          18
        ----------------
       /                /
      / WRITE TO DEV   /
     /      MO        /
    /  VIA FORMAT    /
   /      104       /
   ----------------
                     I
                     I
                     I          19
        ----------------
       /                /
      / WRITE TO DEV   /
     /      MO        /
    /  VIA FORMAT    /
   /      105       /
   ----------------
                     I
                     I
                     I  NOTE  20
* * * * * * * * * * *
*   BEGIN DO LOOP   *
*  5012 IA = 1, 7   *
* * * * * * * * * * *
                     I
                     I<------------I------+
                     I          21
*--------------------*
I   N = LANES + 1    I
*--------------------*
                     I
                     I
                     I  NOTE  22
* * * * * * * * * * *
*   BEGIN DO LOOP   *
*  5013 IC = 1, N   *
* * * * * * * * * * *
                     I
+------------->I
I                    I          23
I       ----------------
I      / WRITE TO DEV  /
I     /      MO       /
I    /  VIA FORMAT   /
I   /      106      /
I  / FROM THE LIST /
I  ----------------
I                    I
I                    I
I                    I  NOTE  24
I * * * * * * * * * * *
I *  LIST = IA, IC,   *
I *  ICOSTS(IA,IC,J,  *
I *   ID),J = 1,8)    *
I * * * * * * * * * * *
I                    I
I                    I
I                    I
I    5013            *    25
I                  *   *
I                *       *
I NO           *           *
+------*   END OF DO   *
           *  LOOP?    *
             *       *
               *   *
                 *
                 IYES
                 I
                 I
                 I
                 I
                 I
                 +--------------+
```

```
+------------------>*
                    I
 5012               *    26
                  *   *
                *       *
  NO          *           *
+------*   END OF DO   *
I          *  LOOP?    *
I            *       *
I              *   *
I                *
I                IYES
I                I
I                I
I                I
I                I
I                I          27
I        ----------------
I       /                /
I      / WRITE TO DEV   /
I     /      MO        /
I    /  VIA FORMAT    /
I   /      105       /
I   ----------------
I                I
I                I
I                I          28
I        ----------------
I       /                /
I      / WRITE TO DEV   /
I     /      MO        /
I    /  VIA FORMAT    /
I   /      111       /
I   ----------------
I                I
I                I
+-----           I          29
*--------------------*
I   N = LANES + 1    I
*--------------------*
                 I
                 I
                 I  NOTE  30
* * * * * * * * * * *
*   BEGIN DO LOOP   *
*  5015 IC = 1, N   *
* * * * * * * * * * *
                 I
+------------->I
I                I          31
I        ----------------
I       / WRITE TO DEV  /
I      /      MO       /
I     /  VIA FORMAT   /
I    /      107      /
I   / FROM THE LIST /
I   ----------------
I                I
I                I
I                I  NOTE  32
I * * * * * * * * * * *
I *    LIST = IC,     *
I * (TOTAL(IC,J,ID),  *
I *     J = 1,8)      *
I * * * * * * * * * * *
I                I
I                I
I    5015        *    33
I              *   *
I NO         *       *
+------*   END OF DO   *
           *  LOOP?    *
             *       *
               *   *
                 *
                 IYES
                 I
                 I
                 I
                 I
                 I          34
         ----------------
        /                /
       / WRITE TO DEV   /
      /      MO        /
     /  VIA FORMAT    /
    /      111       /
    ----------------
                 I
                 I
                 I
                 I  /
               -----
               /58.01
```

```
 57.34--->*
          I          01
    ----------------
   /              /
  / WRITE TO DEV  /
 /      MO       /
/  VIA FORMAT   /
/      111     /
----------------
          I
          I
          I          02
    ----------------
   /              /
  / WRITE TO DEV  /
 /      MO       /
/  VIA FORMAT   /
/      115     /
----------------
          I
          I
          I
   5011   *    03
        *   *
      *       *
    *           *  NO
  *   END OF DO   *-+
    *   LOOP?   *   I
      *       *     I
        *   *       I
          *       ....
          IYES   . 57 .
          I      . 11 .
          I       ....
          I
          I
          I
          I
***YEAR DETAIL PRINT
ROUTINE
          I
 57.08--->I
   5020   I   NOTE  04
* * * * * * * * * * *
*    CONTINUE        *
* * * * * * * * * * *
          I
          I
          I          05
    ----------------
   /              /
  / WRITE TO DEV  /
 /      MO       /
/  VIA FORMAT   /
/      101     /
----------------
          I
          I
          I          06
    ----------------
   / WRITE TO DEV  /
  /      MO       /
 /  VIA FORMAT   /
/      102      /
/ FROM THE LIST /
----------------
          I
          I
          I   NOTE  07
* * * * * * * * * * *
*    LIST = IY,      *
* (DIRECT(J,3),J =   *
*      1,2)          *
* * * * * * * * * * *
          I
          I
          I          08
    ----------------
   /              /
  / WRITE TO DEV  /
 /      MO       /
/  VIA FORMAT   /
/      103     /
----------------
          I
          I
          I          09
    ----------------
   /              /
  / WRITE TO DEV  /
 /      MO       /
/  VIA FORMAT   /
/      104     /
----------------
          I
          I
          +-------------+
```

```
+------------------>*
                    I          10
          ----------------
         /              /
        / WRITE TO DEV  /
       /      MO       /
      /  VIA FORMAT   /
     /      105      /
     ----------------
                    I
                    I
                    I   NOTE  11
     * * * * * * * * * * *
     *   BEGIN DO LOOP   *
     *   5021 IA = 1, 7  *
     * * * * * * * * * * *
                    I
      58.20--->I
                    I          12
     *--------------------*
     I   N = LANES + 1    I
     *--------------------*
                    I
                    I
                    I   NOTE  13
     * * * * * * * * * * *
     *   BEGIN DO LOOP   *
     *   5022 IC = 1, N  *
     * * * * * * * * * * *
                    I
                    I<-------------I------+
                    I   NOTE  14
     * * * * * * * * * * *
     *   BEGIN DO LOOP   *
     *   5023 J = 1, 8   *
     * * * * * * * * * * *
                    I
  +------------->I
  I                 I          15
  I  *--------------------*
  I  I COSTS(IA,IC,J,I)   I
  I  I        =           I
  I  I COSTS(IA,IC,J,1)   I
  I  I        +           I
  I  I COSTS(IA,IC,J,2)   I
  I  *--------------------*
  I                 I
  I                 I
  I                 I
  I       5023   *    16
  I            *   *
  I          *       *
  I  NO    *           *
  +-----*   END OF DO   *
          *   LOOP?   *
            *       *
              *   *
                *
                IYES
                I
                I
                I
                I
                I          17
          ----------------
         / WRITE TO DEV  /
        /      MO       /
       /  VIA FORMAT   /
      /      106      /
     / FROM THE LIST /
     ----------------
                    I
                    I
                    I   NOTE  18
     * * * * * * * * * * *
     *  LIST = IA, IC,    *
     * (COSTS(IA,IC,J,1)  *
     *     ,J = 1,8)      *
     * * * * * * * * * * *
                    I
                    I
                    +-------------+
```

```
+------------------>*
                    I
          5022   *    19
               *   *
             *       *
     NO    *           *
  +-----*   END OF DO   *
  I       *   LOOP?   *
  I         *       *
  I           *   *
  I             *
  I             IYES
  I             I
  I             I
  I             I
  I             I
  I             I
  I     5021   *    20
  I          *   *
  I        *       *
  I      *           *  NO
  I    *   END OF DO   *-+
  I      *   LOOP?   *   I
  I        *       *     I
  I          *   *       I
  I            *       ....
  I            IYES   . 58 .
  I            I      . 12 .
  I            I       ....
--+            I
               I
               I
               I          21
       ----------------
      /              /
     / WRITE TO DEV  /
    /      MO       /
   /  VIA FORMAT   /
  /      105      /
  ----------------
               I
               I
               I          22
       ----------------
      /              /
     / WRITE TO DEV  /
    /      MO       /
   /  VIA FORMAT   /
  /      111      /
  ----------------
               I
               I
               I          23
  *--------------------*
  I   N = LANES + 1    I
  *--------------------*
               I
               I
               I   NOTE  24
  * * * * * * * * * * *
  *   BEGIN DO LOOP   *
  *   5024 IC = 1, N  *
  * * * * * * * * * * *
               I
    58.30--->I
               I   NOTE  25
  * * * * * * * * * * *
  *   BEGIN DO LOOP   *
  *   5025 J = 1, 8   *
  * * * * * * * * * * *
               I
               I<-------------I------+
               I          26
  *--------------------*
  I ITOTAL(IC,J,I) =   I
  I ITOTAL(IC,J,1) +   I
  I  ITOTAL(IC,J,2)    I
  *--------------------*
               I
               I
               +-------------+
```

```
+------------------>*
                    I
           5025   *    27
                *   *
              *       *
      NO    *           *
   +-----*   END OF DO   *
   I       *   LOOP?   *
   I         *       *
   I           *   *
   I             *
   I             IYES
   I             I
   I             I
   I             I
   I             I
   I             I          28
   I      ----------------
   I     / WRITE TO DEV  /
   I    /      MO       /
   I   /  VIA FORMAT   /
   I  /      107      /
   I / FROM THE LIST /
   I ----------------
   I             I
   I             I
   I             I   NOTE  29
   I * * * * * * * * * * *
   I *    LIST = IC,      *
   I * (ITOTAL(IC,J,1),   *
   I *      J = 1,8)      *
   I * * * * * * * * * * *
   I             I
---+             I
                 I
         5024   *    30
              *   *
            *       *
          *           *  NO
        *   END OF DO   *-+
          *   LOOP?   *   I
            *       *     I
              *   *       I
                *       ....
                IYES   . 58 .
                I      . 25 .
                I       ....
                I
                I
                I
                I          31
          ----------------
         /              /
        / WRITE TO DEV  /
       /      MO       /
      /  VIA FORMAT   /
     /      105      /
     ----------------
                I
                I
                I
               ...
              .   .
             .59.09.
              .   .
               ... 5026
```

```
 ***SUMMARY HEADER
PRINT ROUTINE

 57.08*-->*
   5000   I  NOTE  01
* * * * * * * * * * *
*      CONTINUE      *
* * * * * * * * * * *
          I
          I
          I
 ***PRINT SUMMARY
HEADER ONLY ONCE
          I
          I
          I            02
*--------------------*
I   COMPUTED GO TO   I
I      FOR  IY       I
*--------------------*
I  5027        59.04 I
I  5026        59.09 I
*--------------------*
          I
          I
          I
IF OUTSIDE THE RANGE
          I
          I
          I 03
         ...
        .   .
        .59.09.
        .   .
         ... 5026
```

```
           -----------
          /   5027   /
          -----------
               I
 59.02--->I
               I          04
          ----------------
          /               /
        / WRITE TO DEV   /
       /       MO        /
      /  VIA FORMAT    /
     /       101       /
     ----------------
               I
               I
               I          05
          ----------------
          /               /
        / WRITE TO DEV   /
       /       MO        /
      /  VIA FORMAT    /
     /       112       /
     ----------------
               I
               I
               I          06
          ----------------
          /               /
        / WRITE TO DEV   /
       /       MO        /
      /  VIA FORMAT    /
     /       113       /
     ----------------
               I
               I
               I          07
          ----------------
          /               /
        / WRITE TO DEV   /
       /       MO        /
      /  VIA FORMAT    /
     /       105       /
     ----------------
               I
               I
               I          08
          ----------------
          /               /
        / WRITE TO DEV   /
       /       MO        /
      /  VIA FORMAT    /
     /       111       /
     ----------------
               I
 58.31*-->I
   5026    I  NOTE  09
* * * * * * * * * * *
*      CONTINUE      *
* * * * * * * * * * *
               I
               I
               I
 ***TEST FOR YEARLY
SUMMARY PRINT
               I
               I
               I
   5028    *    10
          *   *
        *       *
      *           *  TRUE
    * IPRINT .GT. 3 *-----+
      *           *
        *       *
          *   *
            *
            IFALSE
               I
               I
               I
               I
               I
               I          11
          ----------------
          /               /
        / WRITE TO DEV   /
       /       MO        /
      /  VIA FORMAT    /
     /       111       /
     ----------------
               I
               I
               +--------------------+
```

```
+------------->*
I              I          12
I         ----------------
I        / WRITE TO DEV   /
I       /       MO       /
I      /  VIA FORMAT    /
I     /       108      /
I    / FROM THE LIST /
I    ----------------
I              I
I              I
I              I  NOTE  13
I    * * * * * * * * * * *
I    *       LIST =       *
I    *  (TOTALY(J),J =   *
I    *        1,8)        *
I    * * * * * * * * * * *
I              I
I              I
I              I
I     ***DISCOUNT MINIMUM
I    COSTS
I              I
+------I------------->I
I        5029    I  NOTE  14
I    * * * * * * * * * * *
I    *      CONTINUE      *
I    * * * * * * * * * * *
I              I
I              I
I              I          15
I    *--------------------*
I    I      A = (1 +      I
I    I     RATEI)**IY     I
I    I                    I
I    I     TOTALY(1) =    I
I    I     TOTALY(1)/A    I
I    I                    I
I    I     TOTALY(2) =    I
I    I     TOTALY(2)/A    I
I    I                    I
I    I     TOTALY(3) =    I
I    I     TOTALY(3)/A    I
I    *--------------------*
I              I
I              I
I              I          16
I    *--------------------*
I    I     TOTALY(5) =    I
I    I     TOTALY(5)/A    I
I    I                    I
I    I     TOTALY(8) =    I
I    I     TOTALY(8)/A    I
I    *--------------------*
I              I
I              I
I              I
I     ***ACCUMULATE
I    DISCOUNTED COSTS
I              I
I              I
I              I  NOTE  17
I    * * * * * * * * * * *
I    *   BEGIN DO LOOP    *
I    *   5030 J = 1, 8    *
I    * * * * * * * * * * *
I              I
I              I<------------+
I              I          18 I
I    *--------------------*  I
I    I     TOTALA(J) =    I  I
I    I     TOTALA(J) +    I  I
I    I      TOTALY(J)     I  I
I    *--------------------*  I
I              I             I
I              I             I
I              I             I
I        5030    *    19     I
I              *   *         I
I            *       *       I
I          *           *  NO I
I        *   END OF DO   *---+
I          *   LOOP?   *
I            *       *
I              *   *
I                *
I               IYES
I                I
+                I
                 I
                 I
                 I
                 I
                 I  /
               -----
               /60.01
```

```
                 59.19--->*
                          I
                 ***TEST FOR YEARLY
                SUMMARY PRINT
                          I
                          I
                          I
                          *   01
                        *   *
                      *       *
              TRUE  *           *
            +-----* IPRINT .GT. 3 *
            I       *           *
            I         *       *
            I           *   *
            I             *
            I             IFALSE
            I             I
            I             I
            I             I
            I             I
            I             I
            I             I         02
            I        ----------------
            I        / WRITE TO DEV  /
            I       /      MO       /
            I      /  VIA FORMAT   /
            I     /      109      /
            I    / FROM THE LIST /
            I    ----------------
            I             I
            I             I
            I             I  NOTE  03
            I    * * * * * * * * * * * *
            I    *      LIST =         *
            I    *  (TOTALY(J),J =     *
            I    *       1,8)          *
            I    * * * * * * * * * * * *
            I             I
            I             I
            I             I         04
            I        ----------------
            I        / WRITE TO DEV  /
            I       /      MO       /
            I      /  VIA FORMAT   /
            I     /      110      /
            I    / FROM THE LIST /
            I    ----------------
            I             I
            I             I
            I             I  NOTE  05
            I    * * * * * * * * * * * *
            I    *      LIST =         *
            I    *  (TOTALA(J),J =     *
            I    *       1,8)          *
            I    * * * * * * * * * * * *
            I             I
            I             I
            I             I         06
            I        ----------------
            I        /               /
            I       / WRITE TO DEV  /
            I      /      MO       /
            I     /  VIA FORMAT   /
            I    /      105      /
            I    ----------------
            I             I
            I             I
            I      5031   I  NOTE  07
            I    * * * * * * * * * * * *
            I    *     CONTINUE        *
            I    * * * * * * * * * * * *
            I             I
            +------------>I
                          I
                 2000     *    08
                        *   *
                      *       *          +------------------>*
                    *           *   NO   I                   I          10
                  *   END OF DO   *-+    I            ----------------
                    *   LOOP?   *   I    I            / WRITE TO DEV  /
                      *       *     I    I           /      MO       /
                        *   *       I    I          /  VIA FORMAT   /
                          *       ....   I         /      110      /
                          IYES   . 49 .  I        / FROM THE LIST /
                          I      . 06 .  I        ----------------
                          I       ....   I                   I
                          I              I                   I
                          I              I                   I  NOTE  11
                          I              I        * * * * * * * * * * * *
                          I              I        *      LIST =         *
                 ***PRINT ANALYSIS       I        *  (TOTALA(J),J =     *
                SUMMARY                  I        *       1,8)          *
                          I              I        * * * * * * * * * * * *
                          I              I                   I
                          +--------------+                   I
                                                             I
                                                  RETURN
                                                             I
                                                             I
                                                             I 12
                                                        ---------
                                                        *  EXIT  *
                                                        ---------
```

```
 -----------
 /  MAINT   /
 -----------
      I
55.15--->I
      I  NOTE 01
* * * * * * * * * * *
*   BEGIN DO LOOP   *
*  3010 IA = 1, 7   *
* * * * * * * * * * *
      I
72.11--->I
      I
***TEST TO DETERMINE
IF THERE IS ANY
WORKLOAD
      I
      *  02
  *  HWORK(IA)   *--+  TRUE
  *  .EQ. 0      *  I
      IFALSE   . 72 .
      I        . 11 .
      I         3010
      I
** DETERMINE A
FACTOR FOR THE LEVEL
OF MAINTENANCE
** THE LEVEL OF
MAINTENANCE FACTOR
MUST BE AN INTEGER
NUMBER
      I
      I            03
*--------------------*
I  NA = OVER(6,IA)   I
*--------------------*
      I
** TEST TO DETERMINE
IF WORKLOAD WILL BE
DONE AT LEAST ONCE IN
YEAR
      I
      *  04
  *  NA .GE. 1   *-----+  TRUE
      IFALSE           I
      I                I
***ACCUMULATE          I
MAINTENANCE LEVEL IN   I
FIRST DIRECTION        I
      I                +-----
      *  05
  *  IO .EQ. 1   *------------+  FALSE
      ITRUE
      I  /
   -----
  /64.06


64.05--->*
      I               06
*--------------------*
I  TLEVEL(IA) =      I
I  TLEVEL(IA) +      I
I OVER(6,IA) + .001  I
*--------------------*
      I
+------------>I
      I
** TEST TO DETERMINE
IF ACTIVITY WILL BE
PERFORMED IN ANALYSIS
YEAR
      I
      *  07
  *  TLEVEL(IA)   *--+  TRUE
  *  .LT. 1       *  I
      IFALSE   . 72 .
      I        . 11 .
      I         3010
      I
** RESET THE
ACCUMULATED
MAINTENANCE LEVEL
VARIABLE BECAUSE WORK
EXEC
      I
      *  08
  *  IO .EQ. 2   *-----+  FALSE
      ITRUE            I
      I               09
*--------------------*
I  TLEVEL(IA) = 0    I
*--------------------*
      I<-------------+
      I
** SET LEVEL OF
MAINTENANCE FACTOR TO
ONE
      I               10
*--------------------*
I     NA = 1         I
*--------------------*
------------>I
   3021  I  NOTE 11
* * * * * * * * * * *
*     CONTINUE      *
* * * * * * * * * * *
      I
** DETERMINE THE
CREW HOUR COST FOR
LABOR AND EQUIPMENT
      I               12
*--------------------*
I     CU =           I
I  PS(IA,ITYPE,1)    I
*--------------------*
      I
      +-------------------+


+------------->*
      I
***INITIALIZE
WORKSITE TYPE
      I               13
*--------------------*
I   M = SIM(IA,1)    I
*--------------------*
      I
***DETERMINE IF
WORKSITE IS UNIFORMLY
OR RANDOMLY SPACED
      I               14
*--------------------*
I   N = SIM(IA,5)    I
*--------------------*
      I
***INITIALIZE LF, A
LANE FACTOR USED TO
MODIFY SIMULATION
WORKLOAD
      I               15
*--------------------*
I      LF = 1        I
*--------------------*
      I
** ESTABLISH THE
AMOUNT OF WORKLOAD TO
BE DONE FOR EACH
OCCUPANCY PER
      I               16
*--------------------*
I WK = HWORK(IA)/NA  I
*--------------------*
      I
** ASSIGN CREW
TRAVEL TIME TO TT
      I               17
*--------------------*
I  TT = OVER(5,IA)   I
*--------------------*
      I
** DETERMINE THE
OCCUPANCY FIXED CREW
HOURS FOR EACH
OCCUPANCY
      I               18
*--------------------*
I    FIXHRS =        I
I  2*OVER(8,IA) +    I
I    OVER(7,IA)      I
*--------------------*
      I
** TEST CREW WORK
HOURS AGAINST 24,
WHICH MEANS
CONTINUOUS WORK
      I
      +-------------+


+------------------->*
      I
      *  20
TRUE  *
+-----*  OVER(1,IA)   *
I     *  .NE. 24      *
I     IFALSE
I     I
I ** ASSUME NO CREW
I TRAVEL TIME OR
I FIXHOURS FOR 24 HR
I OCCUPANCY
I     I               21
I *--------------------*
I I     TT = 0         I
I I                    I
I I   FIXHRS = 0       I
I *--------------------*
I     I
I ** ADJUST AVAILABLE
I CREW HOURS FOR TRAVEL
I TIME
I     I
+------------>I
   3050  I            22
*--------------------*
I     CREWT =        I
I  OVER(1,IA) - TT   I
*--------------------*
      I
** ASSIGNMENT
PROCESS FOR ALL
POSSIBLE LANE
CLOSURES
      I
      I  NOTE 23
* * * * * * * * * * *
*   BEGIN DO LOOP   *
*   3031 IC = 1,    *
*      LANES        *
* * * * * * * * * * *
      I
70.24--->I
      I
***TEST TO DETERMINE
IF LANE FACTOR,'LF'
WILL BE SET EQUAL TO
LANES C
      I
      *  24
FALSE *
+-----*  M .EQ. 3   *
I     ITRUE
I     I               25
I *--------------------*
I I     LF = IC        I
I *--------------------*
I     I
+------------>I
      I
***INITIALIZE FIRST
UNAVAILABLE HOUR OF
ROADWAY OCCUPANCY TO
ZERO
      I
      I  /
   -----
  /65.01
```

```
64.26--->*
         I          01
*--------------------*
I      IM1 = 0       I
*--------------------*
         I
         I
         I
***ADJUST THE
AVAILABLE OCCUPANCY
HOURS ARRAY 'IHOUR'
FOR V/C CONSTRA
         I
         I
         I  NOTE  02
* * * * * * * * * * *
*   BEGIN DO LOOP   *
*  3700 IH = 1, 24  *
* * * * * * * * * * *
         I
+------------>I
I             I
I  ***INITIALIZE JHOUR
I  TO IHOUR
I             I
I             I
I             I          03
I  *--------------------*
I  I   JHOUR(IH) =      I
I  I   IHOUR(IH,IA)     I
I  *--------------------*
I             I
I             I
I             I
I    3700   *   04
I         *   *
I       *       *
I  NO *           *
+-----*  END OF DO  *
        *  LOOP?  *
          *     *
            * *
             *
             IYES
             I
             I
             I
             I
             I
***IF DETOUR EXISTS
BYPASS V/C RESTRAINTS
             I
             I
             I
             *   05
           *   *
         *       *
       *  IC .EQ.  *  TRUE
     *  LANES .AND.  *-+
       *OVER(12,IA)*   I
         *.EQ. 0 *     I
           *   *       I
             *      ....
             IFALSE . 65 .
             I      . 16 .
             I       ....
             I       3703
             I
             I
             I
***TEST TO DETERMINE
IF ROAD WILL BE
CLOSED FOR 24 HOURS
             I
             I
             I
             *   06
           *   *
         *       *
       *           *  TRUE
     *  OVER(1,IA)   *-+
       *  .EQ. 24  *   I
         *       *     I
           *   *       I
             *      ....
             IFALSE . 65 .
             I      . 16 .
             I       ....
             I       3703
             I
             I
             +--------------+
```

```
+------------------->*
             I  NOTE  07
* * * * * * * * * * *
*   BEGIN DO LOOP   *
*  3704 IH = 1, 24  *
* * * * * * * * * * *
             I
65.15--->I
             I
***DETERMINE THE
CAPACITY OF CLOSURE
             I
             I
             I          08
*--------------------*
I     CAPACT =       I
I     CAP(IC) +      I
I   (OVER(12,IA)     I
I    *CAP(LANES))    I
*--------------------*
             I
             I
             I
             *   09
           *   *
         *       *
TRUE   *           *
+-----* IC .NE. LANES *
I       *           *
I         *       *
I           *   *
I             *
I             IFALSE
I             I
I             I
I             I
I             I
I             I
I  ***DETERMINE
I  CAPACITY OF SHOULDERS
I             I
I             I
I             I          10
I  *--------------------*
I  I     CAPACT =       I
I  I CAP(IC)*OVER(12,   I
I  I        IA)         I
I  *--------------------*
I             I
+------------>I
     3701     I  NOTE  11
* * * * * * * * * * *
*     CONTINUE      *
* * * * * * * * * * *
             I
             I
             I
***COMPUTE THE
VOLUME CAPACITY RATIO
             I
             I
             I          12
*--------------------*
I      TEMP1 =       I
I      HVOL(IH)      I
I    /(CAPACT*(1 -   I
I PCTADT(IH,6,ID,1)  I
I        ))          I
*--------------------*
             I
             I
             I
***TEST THE
VOLUME-CAPACITY RATIO
AGAINST THE PERMITTED
V/C RATIO
             I
             I
             I
     3702    *   13
           *   *
         *       *
       *           *  FALSE
     *  TEMP1 .GT.   *-----+
       *OVER(10,IA)*
         *       *
           *   *
             *
             ITRUE
             I
             I
             I
             I
             I
             +--------------------+
```

```
+------------->*
             I          14
*--------------------*
I   JHOUR(IH) = 0    I
*--------------------*
             I
+-----I------------->I
             I
     3704   *   15
           *   *
         *       *
       *           *  NO
     *  END OF DO    *-+
       *  LOOP?    *   I
         *       *     I
           *   *       I
             *      ....
             IYES   . 65 .
             I      . 08 .
             I       ....
             I
             I
65.05*-->I
     3703    I  NOTE  16
* * * * * * * * * * *
*     CONTINUE      *
* * * * * * * * * * *
             I
             I
             I
** INITIALIZE THE
NUMBER OF TRAFFIC
CONTROL ZONES FOR
LANE CLOSURE TO
             I
             I
             I          17
*--------------------*
I      NZ = 0        I
*--------------------*
             I
             I
             I
** INITIALIZE THE
ACCUMULATED ZONE
LENGTH FOR LANE
CLOSURE TO ZERO
             I
             I
             I          18
*--------------------*
I      ZL = 0        I
*--------------------*
             I
             I
             I
** INITIALIZE CREW
HOURS FOR LANE
CLOSURE TO ZERO
             I
             I
             I          19
*--------------------*
I   CREWH(IC) = 0    I
*--------------------*
             I
             I
             I
***INITIALIZE NO
AVAILABLE OCCUPANCY
TIME INDEX
             I
             I
             I          20
*--------------------*
I   NOTIME(IC) = 0   I
*--------------------*
             I
             I
             I
** INITIALIZE
OCCUPANCY HOURS FOR
LANE CLOSURE TO ZERO
             I
             I
             I  NOTE  21
* * * * * * * * * * *
*   BEGIN DO LOOP   *
*  3015 IH = 1, 24  *
* * * * * * * * * * *
             I
             I
             +--------------+
```

```
+-----------65.21*--->*
A            I          22
I  *--------------------*
I  I HRS(IA,IH,IC) = 0  I
I  *--------------------*
I            I
I            I
I            I
I    3015   *   23
I         *   *
I       *       *
I  NO *           *
+-----*  END OF DO  *
        *  LOOP?  *
          *     *
            * *
             *
             IYES
             I
             I
             I
             I
             I
**  ESTABLISH
SIMULATION WORKLOAD
DENSITY FACTOR
             I
             I
             I          24
*--------------------*
I      DENSEW =      I
I      SWORK(IA)     I
I    *LF/(WK*IC)     I
*--------------------*
             I
             I
             I
** SIMULATE THE
ASSIGNMENT OF CREWS
TO THE ROAD TO
PERFORM WORK
             I
             I
             I
**  INITIALIZE
VARIABLES FOR
SIMULATION PROCESS
**  PATCH ARRAY
COUNTER
             I
             I
             I          25
*--------------------*
I       IW = 0       I
*--------------------*
             I
             I
             I
**  ACCUMULATED
PRODUCTION TIME
             I
             I
             I          26
*--------------------*
I      TTIME = 0     I
*--------------------*
             I
             I
             I
***ESTABLISH THE
NUMBER OF SIMULATION
ITERATIONS
             I
             I
             I          27
*--------------------*
I ISIM = SIM(IA,4)   I
*--------------------*
             I
             I
             I
***ESTABLISH
SIMULATION FACTOR FOR
RANDOM LOCATIONS
             I
             I
             I          28
*--------------------*
I SFACT = 1000/ISIM  I
*--------------------*
             I
             I
             I
             I /
           -----
           /66.01
```

```
65.28--->*
         I
**  INCREMENT THE
WORKLOAD ARRAY
         I
70.18--->I
  3025   I          01
*--------------------*
I    IW = IW + 1     I
*--------------------*
         I
         I
         I
         *   02
       *   *
     *       *
   *           *  TRUE
 * IW .GT. ISIM  *-+
   *           *   I
     *       *     I
       *   *       I
         *        ....
        IFALSE . 70 .
         I     . 19 .
         I      ....
         I      3030
         I
         I
         I
SUBROUTINE AVAILH
         I
         I
         I
**  IF IMI IS ZERO
THIS IS THE FIRST
TIME FOR
ROUTINE,ACTIVITY,
CLOSURE
         I
         I
         I
         *   03
       *   *
     *       *
   *           *  TRUE
 *  IMI .NE. 0   *-+
   *           *   I
     *       *     I
       *   *       I
         *        ....
        IFALSE . 66 .
         I     . 09 .
         I      ....
         I      3492
         I
         I
         I
**  DETERMINE THE
FIRST HOUR WHEN CREWS
CAN NOT OCCUPY ROAD
         I
         I
         I  NOTE  04
* * * * * * * * * * *
*    BEGIN DO LOOP   *
*  3490 I = 1, 24    *
* * * * * * * * * * *
         I
66.06--->I                 +------------------>*
         I                 I                   I
         *   05            I         3490   *     06
       *   *               I               *   *
     *       *             I             *       *
   *           *  TRUE     I           *           *   NO
 * JHOUR(I) .EQ. *-+       I         *  END OF DO   *-+
   *    0      *   I       I           *  LOOP?   *   I
     *       *     I       I             *       *    I
       *   *       I       I               *   *      I
         *        ....     I                 *       ....
        IFALSE . 66 .      I                IYES . . 66 .
         I     . 08 .      I                 I     . 05 .
         I      ....       I                 I      ....
         I      3491       I                 I
         I                 I                 I
         I                 I                 I
         +-----------------+                 I
                                    **  ASSUME FIRST
                                    OCCUPANCY HOUR TO BE
                                    6AM IF ALL HOURS ARE
                                    AVAILABLE
                                             I
                                             I
                                             I         07
                                    *--------------------*
                                    I      IMI = 6       I
                                    *--------------------*
                                             I
                                             I
                                             +-------------+
```

```
            -----------
           /   3491   /
          -----------
               I
66.05--------->I
               I          08
*--------------------------*
I        IMI = I           I
*--------------------------*
               I
               I
               I
**  INITIALIZE
AVAILABLE CREW HOURS
FOR A CONTINUOUS
OCCUPANCY
               I
+-----------66.03*-->I
   3492        I          09
*--------------------------*
I        AVAIL = 0         I
*--------------------------*
               I
               I
               I
**  DETERMINE FIRST
AVAILABLE OCCUPANCY
HOUR
               I
               I
               I  NOTE  10
* * * * * * * * * * * *
*    BEGIN DO LOOP     *
* 3500 I = IMI, 24     *
* * * * * * * * * * * *
               I
+------------->I
I              I
I              *   11
I            *   *
I          *       *
I        *           *  TRUE
I      * JHOUR(I) .EQ. *-+
I        *    I      *   I
I          *       *     I
I            *   *       I
I              *        ....
I             IFALSE . 67 .
I              I     . 01 .
I              I      ....
I              I      3501
I              I
I              I
I              I
I      3500    *   12
I            *   *
I          *       *
I  NO    *           *
+------*   END OF DO   *
         *   LOOP?   *
           *       *
             *   *
               *
              IYES
               I
               I
               I
               I
               I
**  ALLOW SEARCH TO
CONTINUE INTO NEXT
DAY
               I
               I
               I  NOTE  13
* * * * * * * * * * * *
*    BEGIN DO LOOP     *
*  3504 I = 1, 24      *
* * * * * * * * * * * *   +------------------->*
               I          I                    I
               I<---------I-----+     3504     *     15
               I          I     I            *   *
               *   14     I     I          *       *
             *   *        I     I  NO    *           *
           *       *      I     +------*  END OF DO    *
         *           *  TRUE I           *  LOOP?    *
       * JHOUR(I) .EQ. *-+ I               *       *
         *    I      *   I I                 *   *
           *       *     I I                   *
             *   *       I I                  IYES
               *        .... I                 I
              IFALSE . 67 . I                  I
               I     . 01 . I                  I
               I      .... I                   I
               I      3501 I                   I          16
               I           I          *--------------------------*
               +-----------+          I   NOTIME(IC) = 1         I
                                      *--------------------------*
                                                I
                                                I
                                                I
                                               ...
                                             .70.24.
                                               ... 3031
```

CHART TITLE - SUBROUTINE MAINT

```
** ACCUMULATE IN
AVAIL THE TOTAL HOURS
OF CONTINUOUS
OCCUPANCY

 66.11*-->*
   3501   I  NOTE  01
* * * * * * * * * * *
*      CONTINUE      *
* * * * * * * * * * *
          I
** IM2 IS ASSIGNED
TO 1ST AVAILABLE WORK
HOUR
          I          02
*--------------------*
I       IM2 = I      I
*--------------------*
          I
          I  NOTE  03
* * * * * * * * * * *
*   BEGIN DO LOOP    *
*  3502 J = 1, 24    *
* * * * * * * * * * *
          I
+------------>I
I
I   ***TEST FOR AN
I   AVAILABLE HOUR
I         I
I         *   04
I  * JHOUR(J) .EQ. *-----+
I         0              I
I      IFALSE            I
I         I              I
I   ***ACCUMULATE THE    I
I   NUMBER OF CONTINUOUS I
I   AVAILABLE HOURS      I
I         I              I
I   3502  I          05  I
I  *--------------------*I
I  I AVAIL = AVAIL + 1 I I
I  *--------------------*I
I         I              I
I         *   06         I
I                        +-----
I  NO  *
+------*   END OF DO   *
            LOOP?
          IYES
          I
** ALLOW THE
ACCUMULATED HOURS OF
OCCUPANCY TO CONTINUE
INTO THE NEXT
          I
          I  NOTE  07
* * * * * * * * * * *
*   BEGIN DO LOOP    *
*  3503 J = 1, 24    *
* * * * * * * * * * *
          I
          +-------------------+
```

```
+----67.07*-->*
I             *   08
I                     *  TRUE
I    * JHOUR(J) .EQ. *------+
I             0             I
I          IFALSE           I
I             I             I
I  ** THE WORK PERIOD       I
I  MAY NOT EXCEED 24        I
I  HOURS FOR A GIVEN        I
I  LOOP                     I
I             I             I
I             *   09        I
I                   * TRUE  I
I    *  AVAIL + 1   *---->I
I    *  .GT. 24   *         I
I          IFALSE           I
I             I             I
I    3503     I         10  I
I  *--------------------*   I
I  I AVAIL = AVAIL + 1 I    I
I  *--------------------*   I
I             I             I
I             *   11        I
I  NO  *                    I
I<----*   END OF DO   *     I
I           LOOP?           I
I          IYES             I
I             I             I
I  ** THE VALUE OF J        I
I  ASSIGNED TO IM1          I
I  REFLECTS THE 1ST         I
I  UNAVAILABLE HOUR U       I
I             I             I
+-----I----67.04*-->I<-----------+
I    3505     I         12
I  *--------------------*
I  I       IM1 = J      I
I  *--------------------*
I             I
I   ***MAKE THE
I  CONTINUOUS AVAILABLE
I  OCCUPANCY TIME EQUAL
I  TO
I   ***THE SMALLER VALUE
I  BETWEEN NET CREW TIME
I  'CREWT' OR 'AVAIL'
I             I
I             +-------------------+
```

```
+-------------->*
I             I
I             *   14
I                    * FALSE
I     * CREWT .LT.  *-----+
I         AVAIL           I
I          ITRUE          I
I             I           I
I             I       15  I
I  *--------------------* I
I  I   AVAIL = CREWT    I I
I  *--------------------* I
I             I           I
I             I<----------+
I             I
I  ***ADJUST AVAIL FOR
I  THE FIXED HOURS
I  REQUIRED ON THE
I  ROADWAY
I             I       16
I  *--------------------*
I  I  AVAIL = AVAIL -   I
I  I      FIXHRS        I
I  *--------------------*
I             I
I  ** ESTABLISH THE
I  LOCATION OF THE FIRST
I  WORKSITE IN THE
I  TRAFFIC ZONE
I             I       17
I  *--------------------*
I  I      DIST1 =       I
I  I DENSEW*RLOC(IW)    I
I  *--------------------*
I             I
I  ***INITIALIZE THE
I  SPACING FACTOR 'SF'
I  FOR UNIFORM SPACING
I             I       18
I  *--------------------*
I  I     SF = DIST1     I
I  *--------------------*
I             I
-+
   ** DETERMINE THE
   AMOUNT OF TIME
   REQUIRED TO DO WORK
   AT FIRST SITE
              I       19
   *--------------------*
   I     INDEX = 1      I
   *--------------------*
              I
             ...
           .68.12.
             ... 3100
```

```
          ------------
          /   3120   /
          ------------
               I
69.16--->I
               I  NOTE  20
* * * * * * * * * * *
*      CONTINUE      *
* * * * * * * * * * *
               I
** SUBTRACT WORKTIME
FROM AVAILABLE WORK
TIME
               I          21
*--------------------*
I  AVAIL = AVAIL -   I
I       TIME         I
*--------------------*
               I
** ACCUMULATE THE
PRODUCTIVE WORK TIME
ON THE ROAD
               I          22
*--------------------*
I  TTIME = TTIME +   I
I       TIME         I
*--------------------*
               I
** HOLD THE LOCATION
OF THE WORK SITE
WHICH HAS JUST BEEN
COMPLETED
               I          23
*--------------------*
I   DIST3 = DIST1    I
*--------------------*
               I
** TEST TO DETERMINE
IF AVAILABLE WORK
TIME IS EXCEEDED
               I
               *   24
        *              * (-/0)
     *      AVAIL      *-+
                         I
                        ....
               I (+)   . 69 .
               I       . 17 .
               I        ....
               I        3200
              ...
            .68.01.
              ... 3110
```

```
** INCREMENT THE
WORKLOAD ARRAY

67.24*-->*
  3110   I          01
*--------------------*
I    IW = IW + 1     I
*--------------------*

** IF THE SIMULATION
IS COMPLETE TOTAL
CREW HRS. AND HOLD
OCCUPANCY H

         *    02
   * IW .GT. ISIM *-+  TRUE
        IFALSE . 69 .
               . 17 .
               ....
               3200

** DETERMINE THE
LOCATION OF THE NEXT
WORKSITE ON THE ROAD

***GOTO APPROPRIATE
SPACING FACTOR
                    03
*--------------------*
I   COMPUTED GO TO   I
I      FOR  N        I
*--------------------*
I 3101         68.04 I
I 3102         68.05 I
*--------------------*

IF OUTSIDE THE RANGE

***RANDOM SPACING
LOCATION

68.03--->I
  3101   I          04
*--------------------*
I     DIST2 =        I
I  DENSEW*RLOC(IW)   I
I       *SFACT       I
*--------------------*
```

```
***UNIFORM SPACING,
BASED ON JOINT
SPACING OR SPECIFIED
SPACING FACTO
***SF IS ACCUMULATED
DISTANCE FOR UNIFORM
SPACING IN MILES

68.03--->*
  3102   I          05
*--------------------*
I     SF = SF +      I
I  OVER(2,IA)/5280   I
*--------------------*

***UNIFORM SPACING
LOCATION
                    06
*--------------------*
I     DIST2 = SF     I
*--------------------*

  3103   I  NOTE   07
* * * * * * * * * * *
*      CONTINUE     *
* * * * * * * * * * *

** DETERMINE IF THE
NEXT WORK SITE IS
WITHIN THE ALLOWED
TRAFFIC ZONE
***AND IF IT IS THEN
DETERMINE THE TIME
REQUIRED TO DO WORK
                    08
*--------------------*
I.    INDEX = 3      I
*--------------------*

         *    09
* (DIST2 -   *  TRUE
*  DIST1) .LT.  *-----+
*OVER(9,IA) *
        IFALSE

** COMPUTE THE TIME
REQUIRED TO MOVE AND
INSTALL NEW TRAFFIC
CONTROL
                    10
*--------------------*
I TEMP1 = (DIST2 -   I
I  DIST1)/TCMOVE +   I
I    OVER(8,IA)      I
*--------------------*

***IF THE TRAVEL
TIME TO THE NEXT SITE
EXCEED 2 HRS, GET OFF
ROAD
```

```
***THIS ROUTINE
DETERMINES PRODUCTION
TIME AT WORKSITES

-----------67.19*-->*
A    3100   I  NOTE  12
* * * * * * * * * * *
*      CONTINUE     *
* * * * * * * * * * *

***BRANCH TO THE
APPROPRIATE WORKSITE
TYPE
                    13
*--------------------*
I   COMPUTED GO TO   I
I      FOR  M        I
*--------------------*
I 3104         68.14 I
I 3105         69.10 I
I 3106         69.11 I
*--------------------*

IF OUTSIDE THE RANGE

68.13--->I
  3104   I          14
*--------------------*
I     TEMP2 =        I
I    PATCHF(IW)      I
*--------------------*

         ...
        .69.12.
         ... 3107

+-----I------------>*
              *   15
   *TEMP1 .GT. *  TRUE
 * (OVER(8,IA) + *-+
   *   2)
        IFALSE . 69 .
               . 06 .
               ....
               3123

** DETERMINE TIME
REQUIRED TO DO WORK
AT FIRST SITE IN NEW
T/C ZONE
                    16
*--------------------*
I     INDEX = 2      I
*--------------------*
```

```
 -----------
/   3121   /
 -----------
69.16--->I
         I          17
*--------------------*
I   TIME = TIME +    I
I       TEMP1        I
*--------------------*

***DETERMINE IF
REMAINING AVAILABLE
TIME WILL BE EXCEEDED

         *    18
 * (AVAIL -  *  TRUE
* TIME) .LT. 0. *-+
        IFALSE . 69 .
               . 06 .
               ....
               3123

***ACCUMULATE
TRAFFIC CONTROL ZONE
DISTANCE
                    19
*--------------------*
I     ZL = ZL +      I
I  (DIST3 - DIST1)   I
*--------------------*

***ACCUMULATE THE
NUMBER OF TRAFFIC
CONTROL ZONES
                    20
*--------------------*
I     NZ = NZ + 1    I
*--------------------*

***INITIALIZE FIRST
WORKSITE IN TRAFFIC
CONTROL ZONE
                    21
*--------------------*
I   DIST1 = DIST2    I
*--------------------*

         ...
        .69.07.
         ... 3111
```

```
 ***COMPUTE THE TIME
REQUIRED TO WALK TO
NEXT WORKSITE

 69.16--->*
   3122   I          01
*--------------------*
I TIME1 = (DIST2 -   I
I    DIST3)/WALK     I
*--------------------*
          I
          I
          I
 ***IF THE TIME
REQUIRED TO WALK TO
THE NEXT SITE EXCEEDS
6 MINUTES, D
          I
          I
          I
          *    02
        *   *
      *       *
FALSE *           *
+-----* TIME1 .GT. .1 *
I       *         *
I         *     *
I           * *
I            *
I            ITRUE
I            I
I            I
I            I
I            I
I            I
I            I          03
I   *--------------------*
I   I       TIME1 =      I
I   I TIME1*WALK/TCMOVE  I
I   *--------------------*
I            I
+----------->I
             I
 ***COMPUTE TOTAL
TIME TO DO NEXT WORK
SITE
          I
          I
          I          04
*--------------------*
I   TIME = TIME +    I
I       TIME1        I
*--------------------*

          I
          I
          I
 ***DETERMINE IF
REMAINING AVAILABLE
TIME WILL BE EXCEEDED
          I
          I
          I
          *    05
        *   *
      *       *
    * (AVAIL -   *  TRUE I
  *  TIME) .GE.   *-----+
    *   0.0      *
      *       *
        *   *
          *
          IFALSE
          I
          I
          I
          I
          I
          I
 ***RESET IW TO
REFLECT THAT NEXT
SITE WAS NOT DONE
          I
 68.15*-->I
   3123   I          06
*--------------------*
I    IW = IW - 1     I
*--------------------*
          I
          I
          I
         ...
       .     .
       .69.17.
       .     .
         ... 3200
```

```
** ADJUST THE
AVAILABLE TIME TO
REFLECT PERFORMANCE
OF WORK
+-----------68.21*-->*
I          3111   I          07
           *--------------------*
           I  AVAIL = AVAIL -   I
           I        TIME        I
           *--------------------*
                  I
                  I
                  I
** ADD TO
ACCUMULATED
PRODUCTION TIME
                  I
                  I
                  I          08
           *--------------------*
           I  TTIME = TTIME +   I
           I        TIME        I
           *--------------------*
                  I
                  I
                  I
** RESET THE LAST
SITE WHERE WORK WAS
COMPLETE
                  I
                  I
                  I          09
           *--------------------*
           I   DIST3 = DIST2    I
           *--------------------*
                  I
                  I
                  I
                 ...
               .     .
               .68.01.
               .     .
                 ... 3110
```

```
   -----------
  /   3105   /
  -----------
       I
68.13--->I
       I            10
*--------------------*
I     TEMP2 =        I
I   PATCHP(IW)       I
*--------------------*
       I
       I
       +--------------+
                      I
                      I
                      I
                      +-----------68.14*-->I
```

```
   -----------
  /   3106   /
  -----------
       I
68.13--->I
       I            11
*--------------------*
I     TEMP2 = LF     I
*--------------------*
       I
       I
       I
 ***COMPUTE
PRODUCTION TIME AT A
WORKSITE
       I
--68.14*-->I
       I
  3107  *   12
      *   *
    *       *
TRUE *         *
+-----* PS(IA,ITYPE,  *
I      * 3) .NE. 0 *
I        *       *
I          *   *
I            *
I            IFALSE
I            I
I            I
I            I
I            I
I            I
I            I             13
I      ----------------
I      / WRITE TO DEV   /
I     /       MO       /
I    /   VIA FORMAT   /
I   /      3108      /
I  / FROM THE LIST /
I  ----------------
I            I
I            I
I            I  NOTE  14
I   * * * * * * * * * * *
I   *     LIST = IA     *
I   * * * * * * * * * * *
I            I
+----------->I
   3109      I          15
*--------------------*
I       TIME =       I
I (TEMP2*SIM(IA,2)   I
I          +         I
I SIM(IA,3))/PS(IA,  I
I       ITYPE,3)     I
*--------------------*
          I
          I
          I
 ***RETURN TO
APPROPRIATE PLACE IN
SIMULATION
          I
          I
          I             16
*--------------------*
I   COMPUTED GO TO   I
I     FOR  INDEX     I
*--------------------*
I  3120        67.20 I
I  3121        68.17 I
I  3122        69.01 I
*--------------------*
          I
          I
          I
IF OUTSIDE THE RANGE
          I
 67.24*-->I
   3200   I  NOTE  17
* * * * * * * * * * *
*      CONTINUE     *
* * * * * * * * * * *
          I
          I
          I
 ***ACCUMULATE
TRAFFIC CONTROL ZONE
DISTANCE
          I
          I
          I             18
*--------------------*
I     ZL = ZL +      I
I (DIST3 - DIST1) +  I
I    OVER(11,IA)     I
*--------------------*
          I
          I
          I
          I  /
        ----
       /70.01
```

```
69.18--->*
         I
***ACCUMULATE THE
NUMBER OF TRAFFIC
CONTROL ZONES
         I
         I  01
*--------------------*
I    NZ = NZ + 1     I
*--------------------*
         I
** TOTAL THE CREW
HOURS ON THE ROAD
         I
         I  02
*--------------------*
I  STIME = TTIME +   I
I      FIXHRS        I
*--------------------*
         I
** ACCUMULATE THE
CREW HOURS FOR EACH
ROADWAY OCCUPANCY
         I
         I  03
*--------------------*
I    CREWH(IC) =     I
I    CREWH(IC) +     I
I    STIME + TT      I
*--------------------*
         I
** DETERMINE LAST
HOUR OF ROAD
OCCUPANCY
         I
         I  04
*--------------------*
I M1 = IM2 + STIME   I
*--------------------*
         I
** DETERMINE THE
ACTUAL TIME SPENT IN
LAST OCCUPANCY HOUR
         I
         I  05
*--------------------*
I   RTIME = IM2 +    I
I    STIME - M1      I
*--------------------*
         I
** DETERMINE LAST
EVEN FULL OCCUPANCY
HOUR
         I
         I  06
*--------------------*
I    M1 = M1 - 1     I
*--------------------*
         I
** ASSIGN EACH HOUR
OF ROADWAY OCCUPANCY
TO AN ARRAY FOR EACH
HOUR OF
         I
         I NOTE  07
* * * * * * * * * * *
*   BEGIN DO LOOP   *
* 3201 K = IM2, M1  *
* * * * * * * * * * *
         I
         I<------------I-----+
         I  08
*--------------------*
I       J = K        I
*--------------------*
         I
         +-------------+

+------------------->*
                     I
** NO HOUR MAY
EXCEED 24
                     I
                     *  09
FALSE *   J .GT. 24   *
+-----*
                     *
                     I TRUE
                     I  10
*--------------------*
I    J = J - 24      I
*--------------------*
                     I
+------------------->I
                     I  11
*--------------------*
I  HRS(IA,J,IC) =    I
I  HRS(IA,J,IC) + 1  I
*--------------------*
                     I
3201                 *  12
NO  *   END OF DO   *
+-----*    LOOP?
                     *
                     I YES
                     I
** GET THE LAST HOUR
OF OCCUPANCY
                     I  13
*--------------------*
I    J = J + 1       I
*--------------------*
                     I
** NO HOUR MAY
EXCEED 24
                     I
                     *  14
*   J .GT. 24   * FALSE
                *-----+
                     *
                     I TRUE
                     I  15
*--------------------*
I    J = J - 24      I
*--------------------*
                     I
                     I<-------------+
                     I
** ASSIGN THE
REMAINING OCCUPANCY
TIME TO LAST
OCCUPANCY HOUR
                     I
                     +--------------------+

+------------->*
               I  17
*--------------------*
I  HRS(IA,J,IC) =    I
I  HRS(IA,J,IC) +    I
I      RTIME         I
*--------------------*
               I
** INITIALIZE
OCCUPANCY VARIABLES
               I  18
*--------------------*
I    TTIME = 0       I
*--------------------*
               I
              ...
            .66.01.
              ... 3025

** END OF ROAD
CLOSURE SIMULATION

***DETERMINE THE
AVERAGE TRAFFIC ZONE
LENGTH FOR LANES
CLOSED AND ACT

66.02--->*
3030     I  19
*--------------------*
I  ZONEL(IA,IC) =    I
I      ZL/NZ         I
*--------------------*
         I
***FACTOR CREW AND
OCCUPANCY HOURS FOR
MULTIPLE LANE
CLOSURES
         I
         I  20
*--------------------*
I    CREWH(IC) =     I
I    CREWH(IC)/LF    I
*--------------------*
         I
         I NOTE  21
* * * * * * * * * * *
*   BEGIN DO LOOP   *
*  3029 IH = 1, 24  *
* * * * * * * * * * *
         I
+------->I
         I  22
*--------------------*
I  HRS(IA,IH,IC) =   I
I  HRS(IA,IH,IC)/LF  I
*--------------------*
         I
3029     *  23
NO  *   END OF DO   *
+-----*    LOOP?
         *
         I YES
         I
***END OF LANE
CLOSURE LOOP
         I
66.16--->I
         I
3031     *  24
*   END OF DO   *  NO
*    LOOP?     *-+
         *       I
         I YES  . 64 .
         I      . 24 .
         I
3032     I NOTE  25
* * * * * * * * * * *
*     CONTINUE      *
* * * * * * * * * * *
         I
         I /
        -----
        /71.01
```

CHART TITLE - SUBROUTINE MAINT

```
70.25--->*
         I
 ***ASSIGN DISTANCE
BETWEEN DETOUR EXIST
POINTS TO FREEWAY
 ***INFLUENCE ZONE
FOR ALL LANES CLOSED
         I
         *   01
FALSE *            *
+-----*  OVER(12,IA)  *
I        *  .EQ. 0  *
I            *
I          ITRUE
I            I   02
I *--------------------*
I I ZONEL(IA,LANES) =  I
I I    DETOUR(1)       I
I *--------------------*
+------------>I
 ** DETERMINE THE
TOTAL MAINTENANCE
COST FOR ACTIVITY AND
EACH CLOSURE
         I
 ** RATIO THE ANNUAL
LANE MILE PROJECT
WORKLOAD TO THE
SIMULATION WORK
         I   03
*--------------------*
I       W =          I
I    HWURK(IA)       I
I *PROJLN/SWORK(IA)  I
*--------------------*
         I
 ***DETERMINE CM, THE
MATERIAL COSTS FOR
THE OCCUPANCY
WORKLOAD
         I   04
*--------------------*
I       CM =         I
I    HWORK(IA)       I
I *PROJLN*LANES*PS   I
I  I(A,ITYPE,2)      I
*--------------------*
         I
 ***INITIALIZE THE
WORKLOAD TO ZERO NOW
THAT WORK HAS BEEN
COMPLETED
         I
         *   05
     *        *  * FALSE
 *  ID .EQ. 2   *-----+
         *
       ITRUE
         I
         +--------------------+

+------------->*
I              I      06
I *--------------------*
I I  HWORK(IA) = 0     I
I *--------------------*
+------------->I
 ** GO TO THE
APPRUPRIATE
EXPRESSWAY TYPE
ROUTINE
               I      07
*--------------------*
I  COMPUTED GO TO    I
I     FOR  KP        I
*--------------------*
I  3040       71.08  I
I  3051       71.13  I
I  3060       71.18  I
*--------------------*
               I
IF OUTSIDE THE RANGE
               I
 ** COMPUTE COST FOR
THREE-FOUR LANE
DIVIDED MAINTENANCE
CLOSURES FOR
               I
 71.07--->I
  3040    I           08
*--------------------*
I COSTS(IA,1,1,ID)   I
I        =           I
I (CREWH(2)*2*W*CU)  I
I       + CM         I
I                    I
I COSTS(IA,2,1,IO)   I
I        =           I
I (CREWH(1)*W*2*CU)  I
I       + CM         I
*--------------------*
               I      09
*--------------------*
I COSTS(IA,3,1,IO)   I
I        =           I
I COSTS(IA,1,1,IO)   I
*--------------------*
               I
               *   10
                  * FALSE
 *  NUTIME(1)     *-----+
 *   .EQ. 1   *         I
               *        I
            ITRUE       I
               I      11
*--------------------*  I
I COSTS(IA,3,1,IO)   I  I
I    = 1000000000    I  I
*--------------------*  I
               I        I
               I<-------+
               I 12
              ...
             .71.23.
              ... 3070

 ** COMPUTE COST FOR
FOUR-SIX LANE DIVIDED
MAINTENANCE CLOSURES
FOR YE

 71.07--->*
  3051    I           13
*--------------------*
I COSTS(IA,1,1,IO)   I
I        =           I
I (CREWH(3)*3*W*CU)  I
I       + CM         I
I                    I
I COSTS(IA,2,1,IO)   I
I        =           I
I ((CREWH(2)*2*W +   I
I CREWH(1)*W)*CU) +  I
I        CM          I
*--------------------*
          I           14
*--------------------*
I COSTS(IA,3,1,IO)   I
I        =           I
I (CREWH(1)*W*3*CU)  I
I       + CM         I
I                    I
I COSTS(IA,4,1,IO)   I
I        =           I
I COSTS(IA,1,1,IO)   I
*--------------------*
          I
          *   15
FALSE *            *
+-----*  NOTIME(2)    *
I       *  .EQ. 1  *
I         ITRUE
I          I          16
I *--------------------*
I I COSTS(IA,4,1,IO)   I
I I    = 1000000000    I
I *--------------------*
+------------>I
              I 17
             ...
            .71.23.
             ... 3070

 ** COMPUTE COST FOR
FIVE-EIGHT LANE
DIVIDED MAINTENANCE
CLOSURES FOR

 71.07--->*
  3060    I           18
*--------------------*
I COSTS(IA,1,1,IO)   I
I        =           I
I (CREWH(4)*4*W*CU)  I
I       + CM         I
I                    I
I COSTS(IA,2,1,IO)   I
I        =           I
I ((CREWH(3)*3*W +   I
I CREWH(1)*W)*CU) +  I
I        CM          I
*--------------------*
          I           19
*--------------------*
I COSTS(IA,3,1,IO)   I
I        =           I
I     (CREWH(2)      I
I  *2*W*2*CU) + CM   I
I                    I
I COSTS(IA,4,1,IO)   I
I        =           I
I (CREWH(1)*W*4*CU)  I
I       + CM         I
*--------------------*
          I           20
*--------------------*
I COSTS(IA,5,1,IO)   I
I        =           I
I COSTS(IA,1,1,IO)   I
*--------------------*
          I
          *   21
FALSE *            *
+-----*  NOTIME(2)    *
I       *  .EQ. 1  *
I         ITRUE
I          I          22
I *--------------------*
I I COSTS(IA,5,1,IO)   I
I I    = 1000000000    I
I *--------------------*
+----71.12*-->I
   3070       I  NOTE  23
* * * * * * * * * * *
*     CONTINUE        *
* * * * * * * * * * *
              I  NOTE  24
* * * * * * * * * * *
*   BEGIN DO LOOP     *
*   3072 IC = 1,      *
*       LANES         *
* * * * * * * * * * *
              I /
            -----
            /72.01
```

CHART TITLE - SUBROUTINE MAINT

```
          71.24*-->*<------------+
                   I             I
                   *   01        I
                 *   *           I
               *       *         I
         TRUE *           *      I
      +-----*  NUTIME(IC)    *   I
      I       *  .EQ. 0   *      I
      I         *       *        I
      I           *   *          I
      I             *            I
      I             IFALSE       I
      I             I            I
      I             I            I
      I             I            I
      I             I            I
      I             I            I
      I             I       02   I
      I   *-------------------*  I
      I   I J = LANES - IC +  I  I
      I   I     1             I  I
      I   I                   I  I
      I   I COSTS(IA,J,1,ID)  I  I
      I   I    = 1000000000   I  I
      I   *-------------------*  I
      I             I            I
      +------------>I            I
                    I            I
          3072      *   03       I
                  *   *          I
                *       *        I
              *           *  NO  I
            *   END OF DO   *----+
              *  LOOP?    *
                *       *
                  *   *
                    *
                    IYES
                    I
                    I
                    I
                    I
                    I
                    I                 +----------72.07*-->*
                    *   04            I     A              I            08
                  *   *               I     I    *-------------------*
                *       *             I     I    I  HRS(IA,IH,IC) =  I
        FALSE *           *           I     I    I   HRS(IA,IH,IC)   I
      +-----* NOTIME(LANES) *         I     I    I      *W*IC        I
      I       *  .EQ. 1   *           I     I    *-------------------*
      I         *       *             I     I              I
      I           *   *               I     I              I
      I             *                 I     I              I
      I             ITRUE             I     I     3081     *   09
      I             I                 I     I            *   *
      I             I                 I     I          *       *
      I             I                 I     I  NO    *           *
      I             I                 I     +-----*   END OF DO    *
      I             I                 I              *  LOOP?    *
      I             I       05        I                *       *
      I   *-------------------*       I                  *   *
      I   I COSTS(IA,LANES +  I       I                    *
      I   I    1,1,ID) =      I       I                    IYES
      I   I     1000000000    I       I                    I
      I   *-------------------*       I                    I
      I             I                 I                    I
      +------------>I                 I                    I
                    I                 I                    I
   ** CONVERT THE                     I                    I
   SIMULATION OCCUPANCY               I           3080     *   10
   HOURS TO WORKLOAD                  I                  *   *
   OCCUPANCY HOURS                    I                *       *
   ** FOR EACH LANE                   I        NO    *           *
   CLOSURE FOR THE YEAR               I     +-----*   END OF DO    *
                    I                 I     I        *  LOOP?    *
                    I                 I     I          *       *
                    I  NOTE  06       I     I            *   *
   * * * * * * * * * * *              I     I              *
   *    BEGIN DO LOOP    *            I     I              IYES
   *    3080 IH = 1, 24  *            I     I              I
   * * * * * * * * * * *              I     I              I
                    I                 I     I              I
                    I<----------------I-----+              I
                    I  NOTE  07       I            64.02*-->I
   * * * * * * * * * * *              I                    I
   *    BEGIN DO LOOP    *            I           3010     *   11
   *    3081 IC = 1,     *            I                  *   *
   *       LANES         *            I                *       *
   * * * * * * * * * * *              I              *           *  NO
                    I                 I            *   END OF DO   *-+
                    I                 I              *  LOOP?    *   I
                    +-----------------+                *       *     I
                                                         *   *       I
                                                           *       ....
                                                           IYES   . 64 .
                                                           I      . 02 .
                                                           I       ....
                                                           I
                                                           I
                                                           I
                                                           I 12
                                                       ---------
                                                       *  EXIT  *
                                                       ---------
```

```
 -----------
 /  MOTOR   /
 -----------

 55.16--->*

 ***ACCIDENT
 EQUATIONS INTERCEPTS
 AND COEFFICIENTS

          *
          I        01
 *-------------------*
 I    SCZONE = 1.0   I
 I                   I
 I PWT = WEIGHT(1,1) I
 I                   I
 I     INDEX = 0     I
 *-------------------*
          I
          I
          I
 ***MOTOREST
 LEVEL,DETERMINATION
 OF THE MOTOREST
 IMPACT PERIOD
          I
          I
          I
 ***DETERMINE THE
 APPLICABLE DAYS FOR
 EACH LANE CLOSURE
 DURATION BY
 ***ACTIVITY BY
 CLOSURE TYPE
          I
          I
          I  NOTE  02
 * * * * * * * * * * *
 *   BEGIN DO LOOP   *
 *  5000 IA = 1, 7   *
 * * * * * * * * * * *
          I
 88.12--->I
          I
          *   03
        *   *
      *       *
    *           *  TRUE
  *  OVER(6,IA)   *-+
    *  .EQ. 0   *   I
      *       *     I
        *   *       I
          *        ....
          IFALSE . 88 .
          I      . 12 .
          I        ....
          I        5000
          I
          I
          I
 ***INITIALIZE THE
 FACTOR FOR SIGNALS ON
 DETOUR
          I
          I
          I        04
 *-------------------*
 I     CYCLE = 0     I
 *-------------------*
          I
          I
          I
 ***INITIALIZE THE
 DETOUR TRAFFIC VOLUME
 FACTOR
          I
          I
          I        05
 *-------------------*
 I     DFACT = 1     I
 *-------------------*
          I
          I
          I  NOTE  06
 * * * * * * * * * * *
 *   BEGIN DO LOOP   *
 *   5100 IC = 1,    *
 *       LANES       *
 * * * * * * * * * * *
          I
 86.21--->I
          I
 ***INITIALIZE
 ACCIDENTS
          I
          I
          +-------------+

 +------------------->*
                      I        08
 *-------------------*
 I   ACDTS(IC) = 0   I
 *-------------------*
          I
          I
          I
 ***INITIALIZE POLUTE
          I
          I
          I        09
 *-------------------*
 I  POLUTE(IC) = 0   I
 *-------------------*
          I
          I
          I
 ***INITIALIZE THE
 CROSS OVER FACTOR
 'CROSS'
          I
          I
          I        10
 *-------------------*
 I   CROSS(IC) = 0   I
 *-------------------*
          I
          I
 ***ACCUMULATE THE
 TOTAL HOURS OF
 ROADWAY OCCUPANCY FOR
 EACH LANE CLOS
          I
          I
          I  NOTE  11
 * * * * * * * * * * *
 *   BEGIN DO LOOP   *
 *   5080 IH = 1, 24 *
 * * * * * * * * * * *
          I
 +------------>I
 I    5080     I         12
 I  *-------------------*
 I  I   CROSS(IC) =     I
 I  I   CROSS(IC) +     I
 I  I   HRS(IA,IH,IC)   I
 I  *-------------------*
 I             I
 I             I
 I             I
 I             *   13
 I           *   *
 I         *       *
 I  NO   *           *
 +-----*   END OF DO   *
         *   LOOP?   *
           *       *
             *   *
               *
               IYES
               I
               I
               I
               I
               I
 ***INITIALIZE THE
 CAPACITY TO 'CAP'
 PLUS SHOULDERS IF
 AVAILABLE
          I
          I
          I        14
 *-------------------*
 I     CAPACT =      I
 I     CAP(IC) +     I
 I    CAP(LANES)     I
 I   *OVER(12,IA)    I
 *-------------------*
          I
          I
          I
 ***IF ALL LANES ARE
 CLOSED A DETOUR
 SITUTAION CAN EXIST
          I
          I
          +-------------+

 +------------------->*
                      I
                      *   16
                    *   *
                  *       *
                *           *  TRUE
              * IC .NE. LANES *-----+
                *           *       I
                  *       *         I
                    *   *           I
                      *             +-----I----75.16*-->I
                      IFALSE        A
                      I
                      I
                      I
                      I
                      I
                      I
 ***TEST FOR DETOUR
                      I
                      I
                      I
                      *   17
                    *   *
                  *       *
                *           *  TRUE
              *  OVER(12,IA)  *-----I-----+
                *  .GT. 0   *
                  *       *
                    *   *
                      *
                      IFALSE
                      I
                      I
                      I
                      I
                      I
                      I
 ***COMPUTE THE
 DETOUR VOLUME FACTOR
          I
          I
          I        18
 *-------------------*
 I     DFACT =       I
 I  (VOLUME(1) +     I
 I   DETOUR(4))      I
 I   /VOLUME(1)      I
 *-------------------*
          I
          I
          I
 ***ESTABLISH AVERAGE
 DETOUR STOPS
          I
          I
          I        19
 *-------------------*
 I CYCLE = DETOUR(6) I
 *-------------------*
          I
          I
          I
 ***CAPACITY OF
 DETOUR
          I
          I
          I        20
 *-------------------*
 I     CAPACT =      I
 I     DETOUR(5)     I
 *-------------------*
          I
          I
          +-------------+

 ***DETERMINE
 CAPACITY OF SHOULDERS
 FOR ALL LANES CLOSED

 +------------>*
 I    5090     I        21
 I  *-------------------*
 I  I     CAPACT =      I
 I  I    CAP(LANES)     I
 I  I   *OVER(12,IA)    I
 I  *-------------------*
 I             I
 I             I
 I             I
 I  ***INITIALIZE
 I  STARTING HOUR
 I             I
 +-----I----75.16*-->I
       I    5201     I        22
       I  *-------------------*
       I  I    IBEGIN = I     I
       I  *-------------------*
       I             I
       I   76.11*-->I
       I    5001     I  NOTE  23
       I  * * * * * * * * * * *
       I  *      CONTINUE     *
       I  * * * * * * * * * * *
       I             I
       I             I
       I             I
       I  ***DETERMINE THE
       I  FIRST HOUR OF TRAFFIC
       +  IMPACT
                     I
                     I
                     I  NOTE  24
          * * * * * * * * * * *
          *   BEGIN DO LOOP   *
          * 5500 IH = IBEGIN, *
          *        24         *
          * * * * * * * * * * *
                     I
       +------------>I
       I             I
       I             *   25
       I           *   *
       I         *       *
       I       *           *  TRUE
       I     * HRS(IA,IH,IC) *-+
       I       *  .NE. 0   *   I
       I         *       *     I
       I           *   *       I
       I             *        ....
       I             IFALSE . 76 .
       I             I      . 01 .
       I             I        ....
       I             I        5501
       I             I
       I             I
       I             I
       I    5500     *   26
       I           *   *
       I         *       *
       I  NO   *           *
       +-----*   END OF DO   *
               *   LOOP?   *
                 *       *
                   *   *
                     *
                     IYES
                     I
                     I
                     I
                     I
                     I
          ***GET ANOTHER
          CLOSURE
                     I
                     I
                     I 27
                    ...
                  .     .
                  .86.21.
                  .     .
                    ...   5100
```

```
 ***SET INITIAL
IMPACT HOUR

 75.25--->*
  5501    I          01
*--------------------*
I     IBEGIN = IH    I
*--------------------*
          I
          I
          I
 ***DETERMINE IMPACT
DURATION
          I
          I
          I. NOTE  02
* * * * * * * * * * *
*   BEGIN DO LOOP   *
* 5510 IH = IBEGIN, *
*        23         *
* * * * * * * * * * *
          I
 76.09--->I
          I          03
*--------------------*
I       TEMP1 =      I
I    HRS(IA,IH,IC)   I
I                    I
I       TEMP2 =      I
I HRS(IA,IH + 1,IC)  I
*--------------------*
          I
          I
          I
 ***DETERMINE IF
THERE IS CHANGE IN
OCCUPANCY DURATION
          I
          I
          I
          *    04
       *     *
    *           *
 *                 *  TRUE
*  TEMP1 .EQ.      *-+
 *    TEMP2      *   I
    *           *    I
       *     *       I
          *        ....
          IFALSE . 76 .
          I      . 09 .
          I        ....
          I        5510
          I
          I
          I
 ***SET THE DAYS OF
IMPACT EQUAL TO THE
DIFFERENCE IN
OCCUPANCY DURATI
          I
          I
          I          05
*--------------------*
I  DAYS = TEMP1 -    I
I        TEMP2       I
*--------------------*
          I
          I
          I
 ***OCCUPANCY
DURATION MUST BE
POSITIVE
          I
          I
          I
          *    06
       *     *
    *           *
 *                 * FALSE
*  DAYS .LT. 0     *-----+
 *               *       I
    *           *        I
       *     *           I
          *              +
          ITRUE
          I
          I
          I
          I
          I
          +------------------+
```

```
+------------>*
I             I          07
I  *--------------------*
I  I   DAYS = TEMP1     I
I  *--------------------*
I             I
+------------>I
I             I
I  ***SET THE LAST HOUR
I OF OCCUPANCY
I             I
I             I
I             I          08
+  *--------------------*
   I    IEND = IH       I
   *--------------------*
              I
              I
              +-------------+
```

```
  -----------
 /   5510   /
 -----------
          I
 76.04--->I
          I
          *    09
       *     *
    *           *
 *                 *  NO
*   END OF DO      *-+
 *   LOOP?       *   I
    *           *    I
       *     *       I
          *        ....
          IYES     . 76 .
          I        . 03 .
          I        ....
          I
          I
          I
          I
 ***SET THE DAYS OF
IMPACT FOR FINAL HOUR
          I
          I
          I          10
*--------------------*
I   DAYS = TEMP2     I
*--------------------*
          I
          I
          I
          *    11
       *     *
    *           *
 *                 *  TRUE
*  DAYS .EQ. 0     *-+
 *               *   I
    *           *    I
       *     *       I
          *        ....
          IFALSE . 75 .
          I      . 23 .
          I        ....
          I        5001
          I
          I
          I
 ***SET THE END OF
OCCUPANCY AT FINAL
HOUR
          I
          I
          I          12
*--------------------*
I     IEND = 24      I
*--------------------*
          I
          I
          I
 ***INITIALIZE THE
QUEUE AND THE FIRST
DELAY TIME TO ZERO
          I
--------->I
  5511    I          13
*--------------------*
I     QUEUE = 0      I
I                    I
I     TIME1 = 0      I
*--------------------*
          I
          I
          I
 ***DETERMINE THE
CLOSURE CATEGORY
SUBSCRIPT
          I
          I
          I          14
*--------------------*
I      J = IC        I
*--------------------*
          I
          I
          I
 ***WHEN ALL LANES
ARE CLOSED AND
SHOULDERS ARE
AVAILABLE
 ***USE THE SPEED
CURVE DETERMINED FOR
ONE LANE OPEN TO
MOTOREST
          I
          I
          +-------------+
```

```
+------------------>*
I                   I
I                   *    16
I                *     *
I             *           *
I  FALSE *   IC .EQ.         *
I  +-----*    LANES .AND.    *
I  I          *OVER(12,IA)*
I  I            *.GT. 0 *
I  I               *  *
I  I                *
I  I                ITRUE
I  I                I
I  I                I
I  I                I
I  I                I
I  I                I          17
I  I  *--------------------*
I  I  I   J = LANES - 1    I
I  I  *--------------------*
I  I                I
I  +--------------->I
I                   I          18
I     *--------------------*
I     I     FACT1 = 1      I
I     *--------------------*
I                   I
I                   I
I                   I
I      ***DETERMINE THE
I     VOLUME,DELAY AND
I     SPEED FOR EACH HOUR
I     OF IMPACT
I                   I
I                   I
I                   I  NOTE  19
I     * * * * * * * * * * *
I     *   BEGIN DO LOOP   *
I     * 5520 IH = IBEGIN, *
I     *       IEND        *
I     * * * * * * * * * * *
I                   I
I      77.12--->I
I                   I
I      ***DECREASE THE
I     OCCUPANCY ARRAY BY
I     THE DAYS USED DURING
I     THE IMPACT PE
I                   I
I                   I
I                   I          20
I     *--------------------*
I     I  HRS(IA,IH,IC) =   I
I     I  HRS(IA,IH,IC) -   I
I     I       DAYS         I
I     *--------------------*
I                   I
I                   I
I                   I
I      ***MODIFY THE
I     CAPACITY FOR
I     COMMERCIAL TRAFFIC
I     VOLUME
I                   I
I      77.20--->I
I        5521       I          21
I     *--------------------*
I     I    FCAP = (1 -     I
I     I PCTADT(IH,6,ID,1)  I
I     I     )*CAPACT       I
I     *--------------------*
I                   I
I                   I
I                   I
I      ***DETERMINE THE
I     VOLUME WHICH MUST BE
I     HANDLED DURING THE
I     HOUR
I                   I
I                   I
I                   I          22
I     *--------------------*
I     I   AVOL(IH) =       I
I     I HVOL(IH)*OFACT +   I
I     I      QUEUE         I
I     *--------------------*
I                   I
I                   I
I                   I
I      ***ESTABLISH THE
I     VOLUME WHICH WILL BE
I     HANDLED DURING THE
I     HOUR
I                   I
I                   I
I                   I
I                   I  /
+                 -----
                  /77.01
```

```
76.23--->*
        * 01
FALSE *  AVOL(IH) .GT.  *
         FCAP
        ITRUE
                     02
I  AVOL(IH) = FCAP  I
------------>I
***HOLD ANY EXCESS
VOLUME IN A QUEUE
                     03
I      QUEUE =        I
I HVOL(IH)*OFACT -    I
I   FCAP + QUEUE      I
***THE QUEUE CANNOT
BE LESS THAN ZERO
        * 04
FALSE *  QUEUE .LT. 0  *
        ITRUE
                     05
I      QUEUE = 0      I
------------>I
***DETERMINE THE
DELAY TO THE LAST
VEHICLE WHICH WILL
PASS DURING THE
                     06
I      TIME2 =        I
I  QUEUE/(HVOL(IH)    I
I     *OFACT)         I
***ESTABLISH AN
AVERAGE DELAY FOR ALL
VEHICLES WHICH WILL
PASS IN THE
                     07
I    DELAY(IH) =      I
I     (TIME1 +        I
I  TIME2)/2*FACT1     I
```

```
***RESET THE DELAY
TO BE ASSOCIATED WITH
FIRST VEHICLE IN HOUR
                     08
I   TIME1 = TIME2   I
***COMPUTE
VOLUME-CAPACITY RATIO
                     09
I      VC =          I
I   AVOL(IH)/FCAP    I
***DETERMINE SPEED
MATRIC SUBSCRIPT
                     10
I     I = (VC +      I
I     .15)*10.       I
***DETERMINE THE
SPEED OF VEHICLES
PASSING THROUGH THE
TRAFFIC CONTRO
                     11
I    SPEED(IH) =     I
I     SP(J,I)        I
5520  * 12
   END OF DO   *-+  NO
     LOOP?
       IYES   . 76 .
              . 20 .
       * 13
* QUEUE .EQ. 0  *-+  TRUE
       IFALSE . 77 .
              . 21 .
               5530
```

```
       * 14
* IH .EQ. 24  *-----+  TRUE
       IFALSE
***INCREMENT THE
HOURS BEYOND THE
OCCUPANCY PERIOD TO
ACCOMODATE ANY
                     15
I    IH = IH + 1     I
***RESET THE
CAPACITY TO NORMAL
                     16
I     CAPACT =       I
I  CAP(LANES + 1)    I
       * 17
FALSE *  QUEUE +  *
    HVOL(IH) .LT.
       CAPACT
       ITRUE
                     18
I     FACT1 =        I
I  QUEUE/CAPACT      I
------------>I
***SET J EQUAL
NORMAL SPEED CURVE
                     19
I  J = LANES + 1     I
***INCREMENT THE
IMPACT PERIOD
                     20
I  IEND = IEND + 1   I
...
.76.21.
... 5521
```

```
/   5530   /
---------77.13*-->I
          I  NOTE  21
*     CONTINUE      *
SUBROUTINE VDCOST
***ACCUMULATE
OPERATION COSTS FOR
THE IMPACT PERIOD
                     22
I      ZONE =        I
I   ZONEL(IA,IC)     I
          I  NOTE  23
*   BEGIN DO LOOP    *
*  6000 IH = IBEGIN, *
*       IEND         *
81.20--->I
***INITIALIZE
TEMPORARY VARIABLE
TEMP3 TO ZERO AND
POSITION INDEX TO
                     24
I     INDEX = 0      I
***ROUND NORMAL
SPEED TO INTEGER
VALUE
                     25
I I = SPEEDN(IH) +   I
I       .5           I
***DETERMINE
POLUTION FACTOR FOR
FREEWAY SPEED NORMAL
                     26
I   P = SPEEDN(IH)   I
I      PV =          I
I .89*(EXP(1.193 -   I
I     .032*P) +      I
I .11*(EXP(0.957 -   I
I     .026*P)))      I
***DETERMINE NORMAL
PASSENGER CAR
OPERATION COSTS FOR
THE HOUR
                     27
I      TEMP1 =       I
I   OCOSTS(I,1)      I
I  *HVOL(IH)*(1 -    I
I PCTADT(IH,6,ID,1)  I
I        )           I
          I  /
/78.01
```

```
77.27--->*

***DETERMINE NORMAL
COMMERCIAL VEHICLE
COSTS FOR THE HOUR

01
TEMP2 =
OCOSTS(I,2)
*HVOL(IH)
*PCTAOT(IH,6,IO,
1)

***HOLD NORMAL
OPERATION COST FOR
HOUR

02
QUECST(1) =
TEMP1 + TEMP2

***TEST TO DETERMINE
IF DETOUR CLOSURE IS
BEING PROCESSED

03
IC .NE. LANES   TRUE
FALSE . 78 .
      . 12 .
      6002

04
UVER(I2,IA)
.NE. 0          TRUE
FALSE . 78 .
      . 12 .
      6002

***ROUND DETOUR
SPEED TO INTEGER
VALUE

05
II = SPEEDO(IH) +
.5

***DETERMINE
POLUTION FACTOR FOR
DETOUR NORMAL

07
P = SPEEDD(IH)

PO =
.89*(EXP(1.193 -
.032*P) +
.11*(EXP(0.957 -
.026*P)))

**DETERMINE NORMAL
PASSENGER CAR
OPERATION COSTS IN
DETOUR FOR THE H

08
TEMP3 =
OCOSTS(I1,1)
*OVOL(IH)*(1 -
PCTAOT(IH,6,IO,1)
)

***DETERMINE NORMAL
COMMERCIAL VEHICLE
COSTS IN DETOUR FOR
THE HOUR

09
TEMP4 =
OCOSTS(I1,2)
*OVOL(IH)
*PCTAOT(IH,6,IO,
1)

***COMBINE VEHICLES
AND DETERMINE THEIR
COSTS THROUGH DETOUR

10
TEMP3 = (TEMP3 +
TEMP4)*DETOUR(2)
/SPEEDO(IH)

TEMP1 = (TEMP1 +
TEMP2)*DETOUR(1)
/SPEEDN(IH) +
TEMP3

11
TEMP1 = (TEMP1 +
TEMP2)*ZONEL(IA,
IC)/SPEEDN(IH) +
TEMP3

ZONE = DETOUR(2)

***COMBINE VEHICLES
AND DETERMINE THEIR
COSTS THROUGH TRAFFIC
CONTROL

78.03*-->*
6002            12
TEMP1 = (TEMP1 +
TEMP2)*ZONEL(IA,
IC)/SPEEDN(IH)

***ROUND SPEED
THROUGH TRAFFIC
CONTROL ZONE TO
INTEGER VALUE

6003            13
J = SPEED(IH) +
.5

***DETERMINE
POLUTION FACTOR FOR
INFLUENCE ZONE

14
P = SPEED(IH)

PR =
.89*(EXP(1.193 -
.032*P) +
.11*(EXP(0.957 -
.026*P)))

***HOURLY PASSENGER
CAR OPERATION COSTS
THROUGH THE TRAFFIC
CONTROL Z

15
TEMP2 =
OCOSTS(J,1)
*AVOL(IH)*(1 -
PCTAOT(IH,6,ID,1)
)

***HOURLY COMMERCIAL
VEHICLE OPERATION
COSTS THROUGH THE
TRAFFIC CONT

16
TEMP3 =
OCOSTS(J,2)
*AVOL(IH)
*PCTAOT(IH,6,ID,
1)

***COMBINE VEHICLES
AND DETERMINE THEIR
COSTS THROUGH TRAFFIC
CONTROL

18
TEMP2 = (TEMP2 +
TEMP3)
*ZONE/SPEEO(IH)

***DETERMINE SPEED
CHANGE - DIFFERENCE
BETWEEN NORMAL AND
SPEED THROU

19
K = 1.5*(I - J)

20
FALSE   K .LE. 1
TRUE

21
K = 1

22
FALSE   K .GT. I
TRUE

23
K = I

***SET THE SPEED
CHANGE EQUAL TO
INITIAL SPEED IF A
QUEUE EXIST

24
DELAY(IH)       FALSE
.NE. 0
TRUE   . 79 .
       . 01 .

25
K = I

/79.01
```

```
78.24*-->*
         I          01
*--------------------*
I       S = K        I
*--------------------*
         I
         I
         I
***FACT1 IS THE
TOTAL PASSENGER CARS
DURING THE HOUR
         I
         I
         I          02
*--------------------*
I      FACT1 =       I
I   AVOL(IH)*(1 -    I
I PCTAOT(IH,6,ID,1)  I
I       )*1000       I
*--------------------*
         I
         I
         I
***FACT2 IS THE
TOTAL COMMERCIAL
VEHICLES DURING THE
HOUR
         I
         I
         I          03
*--------------------*
I      FACT2 =       I
I     AVOL(IH)       I
I *PCTAOT(IH,6,ID,   I
I      1)*1000       I
*--------------------*
         I
         I
         I
***FUEL CONSUMPTION
SPEED CHANGE MODELS
         I
80.10*-->I
  6005   I  NOTE  04
* * * * * * * * * * *
*     CONTINUE      *
* * * * * * * * * * *
         I
         I
         I          05
*--------------------*
I A = - 8 + .0035*I  I
I                    I
I      B = .91 +     I
I     .00134*I       I
I                    I
I  TEMP3 = EXP(A +   I
I    B*ALOG(S))      I
I                    I
I        RW =        I
I  CWT**1.2/5.277    I
*--------------------*
         I
         I
         I          06
*--------------------*
I TEMP4 = TEMP3*RW   I
I                    I
I      TEMP3 =       I
I TEMP3*FACT1*FUEL   I
I        (1)         I
I                    I
I      TEMP4 =       I
I TEMP4*FACT2*FUEL   I
I        (2)         I
*--------------------*
         I
         I
         I
***COMBINE PASSENGER
CAR AND COMMERCIAL
VEHICLE COSTS-FUEL
         I
         I
         I          07
*--------------------*
I  TEMP3 = TEMP3 +   I
I       TEMP4        I
*--------------------*
         I
         I
         I
***TIRE WEAR SPEED
CHANGE MODELS
         I
         I
         +-------------+
```

```
+------------------>*
         I          09
*--------------------*
I    RW = - .64 +    I
I      .16*CWT       I
I                    I
I  A = EXP(-4.85 +   I
I      .046*I)       I
I                    I
I   B = EXP(-4.7 +   I
I      .0417*I)      I
I                    I
I   TEMP4 = (-A +    I
I    B*ALOG(S))      I
*--------------------*
         I
         I
         I
         *   10
       *   *
     *       *
FALSE *          *
+-----* TEMP4 .LT. 0. *
I    *           *
I      *       *
I        *   *
I          *
I          I TRUE
I          I
I          I
I          I
I          I
I          I
I          I          11
I  *--------------------*
I  I     TEMP4 = 0      I
I  *--------------------*
I          I
+--------->I
           I          12
*--------------------*
I TEMP5 = RW*TEMP4   I
I                    I
I   RW = - .64 +     I
I     .16*PWT        I
I                    I
I      TEMP4 =       I
I   TEMP4*FACT1*     I
I    TIRES(1)*RW     I
*--------------------*
         I
         I
         I          13
*--------------------*
I      TEMP5 =       I
I   TEMP5*FACT2*     I
I     TIRES(2)       I
*--------------------*
         I
         I
         I
***COMBINE PASSENGER
CAR AND COMMERCIAL
VEHICLE COSTS-TIRES
         I
         I
         I          14
*--------------------*
I  TEMP4 = TEMP4 +   I
I       TEMP5        I
*--------------------*
         I
         I
         I
***OIL CONSUMPTION
SPEED CHANGE MODELS
         I
         I
         I          15
*--------------------*
I RW = EXP(-1.347 +  I
I  .954*ALOG(CWT))   I
I                    I
I   A = - 20.5 +     I
I       .09*I        I
I                    I
I      B = 1.8       I
I                    I
I  TEMP5 = EXP(A +   I
I    B*ALOG(S))      I
*--------------------*
         I
         I
         +-------------+
```

```
+------------------>*
         I          16
*--------------------*
I TEMP6 = TEMP5*RW   I
I                    I
I RW = EXP(-1.347 +  I
I  .954*ALOG(PWT))   I
I                    I
I      TEMP5 =       I
I TEMP5*FACT1*OIL    I
I      (1)*RW        I
*--------------------*
         I
         I
         I          17
*--------------------*
I      TEMP6 =       I
I TEMP6*FACT2*OIL    I
I        (2)         I
*--------------------*
         I
         I
         I
***COMBINE PASSENGER
CAR AND COMMERCIAL
VEHICLE COSTS-OIL
         I
         I
         I          18
*--------------------*
I  TEMP5 = TEMP5 +   I
I       TEMP6        I
*--------------------*
         I
         I
         I
***OPERATION
MAINTENANCE COST
SPEED CHANGE MODELS
         I
         I
         I          19
*--------------------*
I   A = - .298 +     I
I     .00605*I       I
I                    I
I    B = .3642 -     I
I     .00173*I       I
I                    I
I    C = .00506 -    I
I     .000025*I      I
I                    I
I RW = A + B*CWT -   I
I     C*CWT**2       I
*--------------------*
         I
         I
         I          20
*--------------------*
I    FACT3 = A +     I
I B*PWT - C*PWT**2   I
I                    I
I       SS = I       I
I                    I
I     A = 2.56 +     I
I   1.3*ALOG(SS)     I
I                    I
I B = 1.3 + .0068*I  I
*--------------------*
         I
         I
         I          21
*--------------------*
I TEMP6 = EXP(-A +   I
I  B*ALOG(S))/1000   I
I                    I
I TEMP7 = TEMP6*RW   I
I                    I
I      TEMP6 =       I
I TEMP6*FACT1*FACT3  I
*--------------------*
         I
         I
         I          22
*--------------------*
I      TEMP7 =       I
I    TEMP7*FACT2     I
*--------------------*
         I
         I
         I
         I /
       -----
       /80.01
```

```
 79.22--->*
          I
 ***COMBINE PASSENGER
CAR AND COMMERCIAL
VEHICLE
COSTS-MAINTENANCE
          I
          I
          I          01
*-------------------*
I TEMP6 = (TEMP6 +  I
I   TEMP7)*SINDEX   I
*-------------------*
          I
          I
          I
 ***PLACE THE SPEED
CHANGE COST FOR
FUEL,TIRES,OIL AND
MAINTENANCE IN
          I
          I
          I          02
*-------------------*
I  TEMP3 = TEMP3 +  I
I  TEMP4 + TEMP5 +  I
I       TEMP6       I
*-------------------*
          I
          I
          I
 ***HOLD THE SPEED
CHANGE COSTS FOR USE
IF A QUEUE IS LEFT
OVER
          I
          I
          I
          *    03
        *   *
      *       *
  FALSE *          *
+-----* INDEX .EQ. D  *
I       *          *
I         *       *
I           *   *
I             *
I             ITRUE
I             I
I             I
I             I
I             I
I             I
I             I          04
I   *-------------------*
I   I      Q1 =         I
I   I  TEMP3/AVOL(IH)   I
I   *-------------------*
I             I
+------------>I
              I
  ***TEST TO DETERMINE
 IF DETOUR HAS TRAFFIC
 SIGNALS
              I
              I
              I
              *    05
            *   *
          *       *
        *           *  TRUE
      * CYCLE .EQ. D  *-+
        *           *   I
          *       *     I
            *   *       I
              *        ....
              IFALSE . 80 .
              I      . 13 . +------------------->*
              I       ....  I                    I
              I       6D1D  I       ***BRANCH TO
              I             I      APPROPRIATE SPEED
              I             I      CHANGE ROUTINE
              I             I                    I
  ***SET THE INDEX FOR      I                    I
 THE SEQUENCING             I                    I          07
 PROCEDURE                  I      *--------------------*
              I             I      I   COMPUTED GO TO   I
              I             I      I     FOR  INDEX     I
              I          06 I      *--------------------*
   *-------------------*    I      I  6DD6        80.09 I
   I INDEX = INDEX + 1 I    I      I  6DD7        80.11 I
   *-------------------*    I      *--------------------*
              I             I                    I
              I             I                    I
              +-------------+                    I
                                   IF OUTSIDE THE RANGE
                                                 I
                                                 I
                                                 I 08
                                                ...
                                              .     .
                                              .80.13.
                                              .     .
                                                ... 6D1D
```

```
 ***ACCUMULATE SPEED
CHANGE COST DETERMINE
FOR FREEWAY TO DETOUR

 80.D7--->*
  6DD6    I          D9
*--------------------*
I COSTS(IA,IC,2,ID)  I
I          =         I
I COSTS(IA,IC,2,ID)  I
I    + TEMP3*DAYS    I
*--------------------*
          I
          I
          I
 ***SET SPEED CHANGE
AND INITIAL SPEED FOR
NORMAL OPERATION ON
DETOUR
          I
          I
          I          10
*--------------------*
I  S = SPEEDD(IH)    I
I                    I
I  I = SPEEDD(IH)    I
*--------------------*
          I
          I
          I
         ...
       .     .
       .79.D4.
       .     .
         ... 6DD5

 ***ACCUMULATE THE
SPEED CHANGE COSTS
NORMALLY INCURRED ON
DETOUR ROUT

 8D.D7--->*
  6DD7    I          11
*--------------------*
I COSTS(IA,IC,2,ID)  I
I          =         I
I COSTS(IA,IC,2,ID)  I
I          -         I
I  TEMP3*DAYS*DVOL   I
I   (IH)/AVOL(IH)    I
*--------------------*
          I
          I
          I
 ***SET SPEED CHANGE
AND INITIAL SPEED FOR
DETOUR OPERATION ON
DETOUR
          I
          I
          I          12
*--------------------*
I   S = SPEED(IH)    I
I                    I
I   I = SPEED(IH)    I
*--------------------*
          I
          I
          I
         ...
       .     .
       .79.D4.
       .     .
         ... 6DD5
```

```
     -----------
    /   6D1D   /
     -----------
          I
 8D.D5*-->I
          I  NOTE  13
* * * * * * * * * * *
*      CONTINUE     *
* * * * * * * * * * *
          I
          I
          I
 ***DETERMINE AVERAGE
OPERATING SPEED IN
QUEUE
          I
          I
          I          14
*--------------------*
I K = (SPEED(IH) +   I
I     .5)/2.         I
*--------------------*
          I
          I
          I
 ***DETERMINE
PASSENGER CAR DELAY
COST FOR THE HOUR
          I
          I
          I          15
*--------------------*
I      TEMP4 =       I
I FACT1*DCOSTS(K,1)  I
I       /1DDD        I
*--------------------*
          I
          I
          I
 ***DETERMINE
COMMERCIAL VEHICLE
DELAY COSTS FOR THE
HOUR
          I
          I
          I          16
*--------------------*
I      TEMP5 =       I
I FACT2*DCOSTS(K,2)  I
I       /1DDD        I
*--------------------*
          I
          I
          I
 ***COMBINE PASSENGER
CAR AND COMMERCIAL
VEHICLE DELAY COSTS
          I
          I
          I          17
*--------------------*
I    QUECST(2) =     I
I   TEMP4 + TEMP5    I
*--------------------*
          I
          I
          I
 ***DETERMINE THE
LENGTH OF THE QUEUE
          I
          I
          I          18
*--------------------*
I       DIST =       I
I     DELAY(IH)      I
I   *SPEED(IH)/2     I
*--------------------*
          I
          I
          I
 ***DETERMINE NORMAL
COSTS IN QUEUE ZONE
          I
          I
          I          19
*--------------------*
I    QUECST(1) =     I
I     QUECST(1)      I
I *DIST/SPEEDN(IH)   I
*--------------------*
          I
          I
          I
 ***DETERMINE
OPERATION COSTS FOR
VEHICLES WHILE IN
QUEUE
          I
          I
          I
          I  /
       -----
      /81.D1
```

```
80.20--->*
         I        01
QUECST(2) =
   QUECST(2)
   *DELAY(IH)

***DETERMINE NET
OPERATION COSTS IN
QUEUE
                  02
TEMP4 =
  QUECST(2) -
  QUECST(1)

***DETERMINE
POLUTION FACTOR FOR
QUEUE
                  03
P = SPEED(IH)/2

   PQ =
.39*(EXP(1.193 -
   .032*P) +
.11*IEXP(0.957 -
   .026*P)))

***COMPUTE THE TOTAL
OPERATION COST FOR
THE HOUR
                  04
TEMP1 = (TEMP2 +
  TEMP3 + TEMP4 -
  TEMP1)*DAYS

***ACCUMULATE
OPERATION COSTS
                  05
COSTS(IA,IC,2,IO)
      =
COSTS(IA,IC,2,IO)
   + TEMP1

SUBROUTINE POLUTE

***TEST TO DETERMINE
IF ALL LANES ARE
CLOSED
        06
IC .NE. LANES   TRUE
IFALSE . 81 .
       . 14 .
       6020

***TEST TO DETERMINE
IF ANY SHOULDERS ARE
AVAILABLE
        07
OVER(12,IA)   TRUE
  .GT. 0
IFALSE . 81 .
       . 14 .
       6020

***DETERMINE DAYS OF
POLUTION FOR DETOUR
CONDITION

***DETERMINE
PERCENTAGE SPLIT
BETWEEN FREEWAY AND
DETOUR NORMAL
                  08
   FACT1 =
   HVOL(IH)
  /(HVOL(IH) +
   OVOL(IH))

***DETERMINE FREEWAY
DETOUR EQUIVALENT
VEHICLE MILES
                  09
TEMP1 = (PR/PV -
   1)*AVOL(IH)
 *FACT1*DETOUP(1)

***DETERMINE EXTRA
VEHILCE MILES ADDED
BY DETOUR
                  10
   TEMP2 =
(PR/PV)*AVOL(IH)
 *FACT1*(DETOUR(2)
   - DETOURI1))

**DETERMINE FREEWAY
EQUIVALENT NORMAL
DETOUR VEHICLE MILES
                  11
TEMP3 = (PR/PD -
1)*AVOL(IH)*(1 -
FACT1)*DETOURI2)

   TEMP3 =
  PV/PD*TEMP3

***TOTAL THE VEHICLE
MILES
                  13
TEMP1 = TEMP1 +
  TEMP2 + TEMP3

***NON DETOUR
SITUATION
81.06*-->*
 6020   I   NOTE  14
     CONTINUE

***DETERMINE
EQUIVALENT NORMAL
FREEWAY VEHICLE MILES
                  15
TEMP1 = (PR/PV -
1)*AVOLIIH)*ZONE

 6030   I   NOTE  16
     CONTINUE

***DETERMINE NORMAL
FREEWAY EQUIVALENT
VEHICLE MILES FOR
QUEUE
                  17
TEMP2 = IPQ/PV -
1)*AVOLIIH)*DIST

***TOTAL THE VEHICLE
MILES
                  18
TEMP1 = TEMP1 +
    TEMP2

***ACCUMULATE
VEHICLE MILES OF
POLUTION
                  19
 POLUTE(IC) =
 POLUTEIIC) +
 TEMP1*DAYS

6000    *   20
END OF DO       NO
  LOOP?
IYES      . 77 .
          . 24 .
/82.01
```

```
81.20--->*
         I
         *   01
       *   *
     *       *
   *           *  TRUE
 * QUEUE .EQ. 0  *-+
   *           *   I
     *       *     I
       *   *       I
         *        ....
         IFALSE . 82 .
         I       . 15 .
         I        ....
         I        6040
         I
         I
         I
 ***ADJUST POLUTION
 DAYS TO INCLUDE
 VEHICLES LEFT IN THE
 QUEUE
         I
         I
         I            02
*--------------------*
I   POLUTE(IC) =     I
I   POLUTE(IC) +     I
I     (PQ/PV -       I
I   1)*QUEUE*DIST    I
*--------------------*
         I
         I
         I
 ***MAKE ADJUSTMENT
 IN OPERATION COSTS
 FOR ANY VEHICLE LEFT
 IN QUEUE
         I
         I
         I
 ***GET THE NORMAL
 SPEED OF VEHICLES ON
 THE FREEWAY
         I
         I
         I            03
*--------------------*
I I = SPEEDN(24) +   I
I       .5           I
*--------------------*
         I
         I
         I
 ***COMPUTE THE
 NORMAL TIME FOR
 PASSING THRU THE
 CLUSURE ZONE
         I
         I
         I            04
*--------------------*
I       C =          I
I   ZONEL(IA,IC)     I
I    /SPEEDN(24)     I
*--------------------*
         I
         I
         I
 ***COMPUTE THE PASS.
 CAR OPERATING COSTS
 FOR PASSING THRU THE
 ZONE
         I
         I
         I            05
*--------------------*
I     TEMP1 =        I
I QUEUE*OCOSTS(I,1)  I
I       *(1 -        I
I PCTADT(24,6,IO,1)  I
I       )*C          I
*--------------------*
         I
         I
         I
 ***COMPUTE THE COM.
 VEHICLE OPERATING
 COSTS FOR PASSING
 THRU THE ZONE
         I
         I
         +-------------+

+------------------>*
                    I            07
*--------------------*
I      TEMP2 =       I
I QUEUE*OCOSTS(I,2)  I
I *PCTADT(24,6,IO,   I
I       1)*C         I
*--------------------*
         I
         I
         I
 ***COMBINE OPERATING
 COSTS, COMPUTE SPEED
 CHANGE COSTS, AND
 EXPAND BY
         I
         I
         I            08
*--------------------*
I TEMP1 = (TEMP1 +   I
I      TEMP2 +       I
I  QUEUE*QI)*DAYS    I
*--------------------*
         I
         I
         I
 ***COMPUTE THE
 AVERAGE SPEED OF A
 VEHICLE LEFT IN THE
 QUEUE
         I
         I
         I            09
*--------------------*
I  K = SP(LANES +    I
I   1,11)/2 + .5     I
*--------------------*
         I
         I
         I
 ***COMPUTE PASSENGER
 CAR OPERATING COSTS
 IN THE QUEUE
         I
         I
         I            10
*--------------------*
I      TEMP3 =       I
I QUEUE*OCOSTS(K,1)  I
I       *(1 -        I
I PCTADT(24,6,IO,1)  I
I         )          I
*--------------------*
         I
         I
         I
 ***COMPUTE THE
 COMMERCIAL VEHICLE
 OPERATING COSTS IN
 THE QUEUE
         I
         I
         I            11
*--------------------*
I      TEMP4 =       I
I QUEUE*OCOSTS(K,2)  I
I *PCTADT(24,6,IO,   I
I         1)         I
*--------------------*
         I
         I
         I
 ***COMBINE
 COMMERCIAL&PASSENGER
 CAR QUEUE COSTS AND
 EXPAND BY DELAY A
         I
         I
         I            12
*--------------------*
I TEMP3 = (TEMP3 +   I
I TEMP4)*DELAY(24)   I
I       *DAYS        I
*--------------------*
         I
         I
         I
 ***ADJUST UPERATING
 COSTS FOR VEHICLES
 LEFT IN THE QUEUE
         I
         I
         +-------------+

+------------------>*
                    I            14
*--------------------*
I COSTS(IA,IC,2,IO)  I
I         =          I
I COSTS(IA,IC,2,IO)  I
I  + TEMP1 + TEMP3   I
*--------------------*
         I
 82.01--->I
 6040    I  NOTE  15
* * * * * * * * * * *
*     CONTINUE      *
* * * * * * * * * * *
         I
         I
         I
 SUBROUTINE TIME
         I
         I
         I
 ***INITIALIZE DETOUR
 PARAMETERS TO ZERO
         I
         I
         I            16
*--------------------*
I     FACT2 = 0      I
I                    I
I     TEMP2 = 0      I
I                    I
I     TIMELO = 0     I
*--------------------*
         I
         I
         I  NOTE  17
* * * * * * * * * * *
*   BEGIN DO LOOP   *
* 6100 IH = IBEGIN, *
*       IEND        *
* * * * * * * * * * *
         I
 84.07--->I
         I
 ***THE WEIGHTED
 VALUE OF COMMERCIAL
 TIME IS TEMP1
         I
         I
         I            18
*--------------------*
I      TEMP1 =       I
I COMVOT*PCTADT(IH,  I
I     6,IO,1)        I
*--------------------*
         I
         I
         I
 ***COMPUTE AVERAGE
 SPEED IN SPEED CHANGE
 ZONE
         I
         I
         I            19
*--------------------*
I      TEMP3 =       I
I .25*SPEEDN(IH) +   I
I   .75*SPEED(IH)    I
*--------------------*
         I
         I
         I
 ***COMPUTE TIME LOST
 IN SPEED CHANGE ZONE
         I
         I
         I            20
*--------------------*
I      TEMP3 =       I
I (SCZONE/TEMP3 -    I
I SCZONE/SPEEDN(IH)  I
I        )*2         I
*--------------------*
         I
         I
         I
 ***IF A QUEUE EXISTS
 COMPUTE TIME LOST IN
 SPEED CHANGES
         I
         I
         +-------------+

+------------------>*
                    I
                    *   22
                  *   *
                *       *
  FALSE      *             *
+------*    DELAY(IH)       *
I        *    .NE. 0      *
I          *            *
I             *       *
I                *
I                ITRUE
I                I
I                I
I                I
I                I
I                I            23
I  *--------------------*
I  I      TEMP3 =       I
I  I   1.67*SCZONE/     I
I  I    SPEEDN(IH)      I
I  *--------------------*
I                I
+-------------->I
                 I
 ***BYPASS THE
 COMPUTATION OF LOSS
 TIME FOR DETOUR
 UNLESS ALL LANES AR
  ***AND THE SHOULDERS
 ARE NOT AVAILABLE TO
 TRAFFIC
         I
         I
         I
         *   24
       *   *
     *       *
   *           *  TRUE
 * IC .NE. LANES *-+
   *           *   I
     *       *     I
       *   *       I
         *        ....
         IFALSE . 83 .
         I       . 20 .
         I        ....
         I        6110
         I
         I
         *   25
       *   *
     *       *
   *           *  TRUE
 * OVER(12,IA)   *-+
   *  .GT. 0   *   I
     *       *     I
       *   *       I
         *        ....
         IFALSE . 83 .
         I       . 20 .
         I        ....
         I        6110
         I
         I
         I
 ***TIMEL IS THE TIME
 LOST BY A MOTORIST
 WHO NORMALLY TRAVELS
 THE FREW
  ***IS FORCED TO
 TRAVEL THE DETOUR
 ROUTE
         I
         I
         I            26
*--------------------*
I      TIMEL =       I
I     DETOUR(2)      I
I   /SPEED(IH) -     I
I     DETOUR(1)      I
I   /SPEEDN(IH) +    I
I DELAY(IH) + TEMP3  I
*--------------------*
         I
         I
         I
 ***COMPUTE AVERAGE
 SPEED IN SPEED CHANGE
 ZONE
         I
         I
         I
         I  /
       -----
       /83.01
```

```
82.27--->*
         I          01
*--------------------*
I      TEMP4 =       I
I .25*SPEEDO(IH) +   I
I   .75*SPEED(IH)    I
*--------------------*

***COMPUTE TIME LOST
IN SPEED CHANGE ZONE
         I          02
*--------------------*
I      TEMP4 =       I
I  (SCZONE/TEMP4 -   I
I SCZONE/SPEEDO(IH)  I
I       )*2          I
*--------------------*

***IF A QUEUE EXISTS
COMPUTE TIME LOST IN
SPEED CHANGES
         *   03
FALSE *  DELAY(IH)  *
         *  .NE. 0  *
         ITRUE
         I          04
*--------------------*
I      TEMP4 =       I
I    1.67*SCZONE/    I
I     SPEEDO(IH)     I
*--------------------*
+------------>I

***TIMELO IS THE
TIME LOST BY A
MOTORIST WHO NORMALLY
TRAVELS THE DET
         I          05
*--------------------*
I      TIMELO =      I
I     DETOUR(2)      I
I    /SPEED(IH) -    I
I     DETOUR(2)      I
I    /SPEEDO(IH) +   I
I DELAY(IH) + TEMP4  I
*--------------------*

***FACT1 IS THE
RATIO OF THE NORMAL
FREEWAY VOLUME TO THE
TOTAL VOLUM
***DETOUR ROUTE
         I          06
*--------------------*
I      FACT1 =       I
I      HVOL(IH)      I
I   /(HVOL(IH) +     I
I     DVOL(IH))      I
*--------------------*

***FACT2 IS THE
RATIO OF THE NORMAL
VOLUME ON THE DETOUR
ROUTE TO THE
         I
         +-------------+

+------------------>*
                    I
***VOLUME ON THE
DETOUR ROUTE
         I          08
*--------------------*
I      FACT2 =       I
I      DVOL(IH)      I
I   /(HVOL(IH) +     I
I     DVOL(IH))      I
*--------------------*

***J IS THE TIMELOSS
ON THE DETOUR ROUTE
IN MINUTES TO THE
NEAREST MI
         I          09
*--------------------*
I        J =         I
I ABS(TIMELO)*60 +   I
I        .5          I
*--------------------*
         *   10
      *  J .EQ. 0  *  TRUE ---> 83.14 / 6102
         IFALSE
         *   11
FALSE *  J .GT. 40  *
         ITRUE
         I          12
*--------------------*
I       J = 40       I
*--------------------*
+------------>I

***ACCUMULATE THE
WEIGHTED VALUES OF
TIME LOSS FOR ALL
TRIP PURPOSES
         I          13
*--------------------*
I   TEMP2 = TEMP1    I
*--------------------*
         I NOTE  14
* * * * * * * * * * *
*   BEGIN DO LOOP   *
*  6101 IT = 1, 5   *
* * * * * * * * * * *
         I
         +-------------+

+------------------->*
6102    I  NOTE  15
* * * * * * * * * * *
*     CONTINUE      *
* * * * * * * * * * *
         I          16
*--------------------*
I     TEMP2 = 0      I
*--------------------*
         I
         +-------------+

+----------83.14*-->*
A        I          17
*--------------------*
I  TEMP2 = TEMP2 +   I
I    VTRATE(IT,J)    I
I *PCTADT(IH,IT,IO,  I
I        1)          I
*--------------------*
6101     *   18
NO *   END OF DO   *
   *     LOOP?     *
         IYES

***COMPUTE THE VALUE
OF TIME LOST TO
DETOUR ROUTE
MOTORISTS
         I          19
*--------------------*
I      TEMP2 =       I
I   TEMP2*TIMELO     I
*--------------------*
         I
         +-------------+

***COMPUTE THE TIME
LOSS ON THE FREEWAY
FOR A NONDETOUR
SITUATION

82.24*-->*
 6110    I          20
*--------------------*
I      TIMEL =       I
I   ZONEL(IA,IC)     I
I   /SPEED(IH) -     I
I   ZONEL(IA,IC)     I
I   /SPEEDN(IH) +    I
I     DELAY(IH)      I
I                    I
I  TIMEL = TIMEL +   I
I      TEMP3         I
*--------------------*

***SET THE RATIO OF
THE FREEWAY NORMAL
VOLUME TO THE TOTAL
VOLUME EQU
         I          21
*--------------------*
I     FACT1 = 1      I
*--------------------*

***I IS THE TIME
LOST TO A FREEWAY
MOTORIST IN MINUTES
TO THE NEAREST
+----------83.16*-->I
 6120    I  NOTE  22
* * * * * * * * * * *
*     CONTINUE      *
* * * * * * * * * * *
         I          23
*--------------------*
I        I =         I
I  ABS(TIMEL)*60 +   I
I        .5          I
*--------------------*
         *   24
      *  I .EQ. 0  *  TRUE  . 84 .
         IFALSE           . 07 .
                          6100
         *   25
      *  I .GT. 40  *  FALSE
         ITRUE            . 84 .
                          . 01 .
         I          26
*--------------------*
I       I = 40       I
*--------------------*
         I  /
       -----
       /84.01
```

```
83.25*-->*
   ***ACCUMULATE THE
   WEIGHTED VALUES OF
   TIME LOST
      NOTE 01
   * BEGIN DO LOOP *
   * 6121 IT = 1, 5 *
      02
   I TEMP1 = TEMP1 +    I
   I   VTRATE(IT,I)     I
   I *PCTAOT(IH,IT,ID,  I
   I   1)               I
   6121  *  03
   NO  *  END OF DO  *
          LOOP?
      IYES
   ***COMPUTE THE VALUE
   OF TIME LOST TO
   FREEWAY MOTORISTS
      04
   I    TEMP1 =        I
   I   TEMP1*TIMEL     I
   ***COMPUTE THE
   AMOUNT OF TIME LOST
   BY ALL MOTORISTS IN
   HOURS
      05
   I COSTS(IA,IC,6,ID) I
   I        =          I
   I COSTS(IA,IC,6,ID) I
   I        +          I
   I     AVOL(IH)      I
   I   *DAYS*1000*     I
   I  (TIMEL*FACT1 +   I
   I   TIMELO*FACT2)   I
   ***COMPUTE THE VALUE
   OF TIME LOST FOR ALL
   MOTORISTS
      06
   I COSTS(IA,IC,5,ID) I
   I        =          I
   I COSTS(IA,IC,5,ID) I
   I        +          I
   I     AVOL(IH)      I
   I   *DAYS*1000*     I
   I  (TEMP1*FACT1 +   I
   I   TEMP2*FACT2)    I

----------83.24*-->*
   6100  *  07
   *  END OF DO  *  NO
       LOOP?
      IYES    . 82 .
              . I8 .
      *  08
   * QUEUE .EQ. 0  *  TRUE
      IFALSE
   ***MAKE ADJUSTMENT
   TO TIME LOSS AND TIME
   COST FOR VEHICLES
   LEFT IN QU
      09
   I      TEMP2 =       I
   I COMVOT*PCTAOT(24,  I
   I     6,ID,1)        I
   I      TEMP1 =       I
   I QUEUE/CAP(LANES +  I
   I      1)*.5         I
   I I = TEMP1*60 + .5  I
      *  10
   FALSE *  I .EQ. 0  *
      ITRUE
      11
   I       I = I        I
      *  12
   *  I .GT. 40  *  FALSE
      ITRUE
      I /
   /84.13

84.12--->*
      13
   I      I = 40       I
      NOTE 14
   * BEGIN DO LOOP *
   * 6130 IT = 1, 5 *
      15
   I TEMP2 = TEMP2 +   I
   I   VTRATE(IT,I)    I
   I *PCTAOT(24,IT,ID, I
   I   1)              I
   6130  *  16
   *  END OF DO  *  NO
       LOOP?
      IYES
      17
   I COSTS(IA,IC,5,ID) I
   I        =          I
   I COSTS(IA,IC,5,ID) I
   I        +          I
   I   TEMP2*TEMP1*    I
   I QUEUE*1000*DAYS   I
      18
   I COSTS(IA,IC,6,ID) I
   I        =          I
   I COSTS(IA,IC,6,ID) I
   I        +          I
   I TEMP1*QUEUE*1000* I
   I      DAYS         I
   6140  I  NOTE 19
   *    CONTINUE    *
   SUBROUTINE ACCID
   ***INITIALIZE NORMAL
   ACCIDENTS ON THE
   DETOUR TO ZERO
      20
   I    TEMP3 = 0      I
   *** SET TEMP6 EQUAL
   TO THE AVERAGE ZONE
   LENGTH
      21
   I     TEMP6 =       I
   I  ZONFL(IA,IC)     I
      I /
   /85.01
```

```
84.21--->*
         I
 ***IF THE TRAFFIC IS
OETOUREO THE ZONE
LENGTH IS THE
DISTANCE
 ***BETWEEN
INTERCHANGES
         I
         I
         I
         *     01
       *   *
     *       *
FALSE *  IC .EQ.  *
+-----*  LANES .ANO.  *
I       *OVER(12,IA)*
I        *.EQ. 0 *
I          *   *
I            *
I          ITRUE
I            I
I            I     02
I *--------------------*
I I TEMP6 = OETOUR(1) I
I *--------------------*
I            I
+------------>I
             I
 ***COMPUTE THE
NORMAL ANNUAL
ACCIOENTS ON THE
FREEWAY
         I
         I
         I         03
*--------------------*
I      TEMP1 =       I
I  ACO(LANES,1) +    I
I   ACO(LANES,2)     I
I  *ALOG(TEMP6) +    I
I   ACO(LANES,3)     I
I  *ALOG(VOLUME(1)   I
I  *2000*ABS(IO -    I
I       1 -          I
I  SPLIT(1)/100))    I
*--------------------*
         I
         I
         I
 ***TEST FOR DETOUR
         I
         I
         I
         *     04
       *   *
     *       *
   *  IC .EQ.  *  TRUE
  *  LANES .ANO.  *--+
    *OVER(12,IA)*    I
     *.EQ. 0 *       I
       *   *         I
         *         ....
         IFALSE   . 85 .
         I        . 14 .
         I         ....
         I         6210
         I
         I
         I
***GET SUBSCRIPT FOR
ACCIDENT EQUATION
COEFICIENTS
         I
         I
         I         05
*--------------------*
I  I = LANES - IC    I
*--------------------*
         I
         I
         I
***SET FACTOR FOR
MORE THAN ONE
SHOULDER TO 1
         I
         I
         +-------------+
```

```
+------------------->*
I                    I          07
I  *--------------------*
I  I     FACT3 = 1      I
I  *--------------------*
I             I
I             I
I             I
I  ***IF  ALL LANES ARE
I  CLOSED SET SHOULOER
I  FACTOR EQUAL TO
I  NUMBER OF SH
I             I
I             I
I             I
I             *    08
I           *   *
I         *       *
I  FALSE *          *
I  +-----*  I .EQ. 0   *
I  I       *          *
I  I         *      *
I  I           *  *
I  I            *
I  I            ITRUE
I  I             I
I  I             I
I  I             I
I  I             I
I  I             I          09
I  I  *--------------------*
I  I  I      FACT3 =        I
I  I  I    OVER(12,IA)      I
I  I  *--------------------*
I  I             I
I  +------------>I
I                I
I  ***IF ALL LANES ARE
I  CLOSEO SET ACCIOENTS
I  EQUATION COEFICIENTS
I  SUBSCRI
I             I
I             I
I             I
I             *    10
I           *   *
I         *       *
I  FALSE *          *
I  +-----*  I .EQ. 0   *
I  I       *          *
I  I         *      *
I  I           *  *
I  I            *
I  I            ITRUE
I  I             I
I  I             I
I  I             I
I  I             I
I  I             I          11
I  I  *--------------------*
I  I  I        I = 1        I
I  I  *--------------------*
I  I             I
I  +------------>I
I                I
I  ***COMPUTE THE
I  ANNUAL ACCIOENTS FOR
I  THE CLOSURE SITUATION
I             I
I             I
I             I           12
I  *--------------------*
I  I     TEMP2 =         I
I  I   ACO(I,1) +        I
I  I    ACO(I,2)         I
I  I *ALOG(ZONEL(IA,     I
I  I     IC)) +          I
I  I    ACO(I,3)         I
I  I *ALOG((VOLUME(1)    I
I  I  *2000*ABS(IO -     I
I  I       1 -           I
I  I  SPLIT(1)/100))     I
I  I      /FACT3)        I
I  *--------------------*
I             I
I             I
+             I
   *** SKIP THE
   COMPUTATION OF
   ACCIDENTS ON THE
   DETOUR
              I
              I
              I 13
             ...
           .     .
           .85.20.
           .     .
             ... 6220
```

```
*** SET THE                          I
SUBSCRIPT FOR THE                    I
ACCIOENTS EQUATION                   I
COEFFICIENTS FOR THE                 I
                                     I
85.04--->*                           I
  6210   I           14              I
*--------------------*               I
I I = 4 + OETOUR(7) I                I
*--------------------*               I
         I                           I
         I                           I
         I                           I
         *    15                     I
       *   *                         I
     *       *                       I
FALSE *        *                     I
+-----*  I .GT. 7   *                I
I       *        *                   I
I         *    *                     I
I           *  *                     I
I            *                       I
I          ITRUE                     I
I            I                       I
I            I                       I
I            I                       I
I            I                       I
I            I        16             I
I *--------------------*             I
I I       I = 7        I             I
I *--------------------*             I
I            I                       I
+------------>I                      I
             I                       I
***COMPUTE THE                       I
ANNUAL ACCIDENTS FOR                 I
THE DETOUR ROUTE WITH                I
FREEWAY TRA                          I
         I                           I
         I                           I
         I            17             I
*--------------------*               I
I     TEMP2 =        I               I
I   ACO(I,1) +       I               I
I    ACO(I,2)        I               I
I *ALOG(OETOUR(2))   I               I
I        +           I               I
I    ACO(I,3)        I               I
I *ALOG(IOETOUR(4)   I               I
I        +           I               I
I    VOLUME(1))      I               I
I  *2000*ABS(IO -    I               I
I       1 -          I               I
I  SPLIT(1)/100))    I               I
*--------------------*               I
         I                           I
         I                           I
         I                           I
***COMPUTE THE                       I
NORMAL ANNUAL                        I
ACCIOENTS FOR THE                    I
OETOUR                               I
         I                           I
         I                           I
         I            18             I
*--------------------*               I
I     TEMP3 =        I               I
I   ACO(I,1) +       I               I
I    ACO(I,2)        I               I
I *ALOG(OETOUR(2))   I               I
I        +           I               I
I    ACO(I,3)        I               I
I  *ALOG(OETOUR(4)   I               I
I  *1000*ABS(IO -    I               I
I       1 -          I               I
I  SPLIT(1)/100))    I               I
I                    I               I
I     TEMP3 =        I               I
I  EXP(TEMP3)/2      I               I
*--------------------*               I
         I                           I
         I                           I
         I                           I
***COMPUTE THE                       I
ANNUAL INCREASE IN                   I
ACCIOENTS CAUSEO BY                  I
THE CLOSURE                          I
         I                           I
         I                           I
         +---------------------------+
```

```
+-----------85.13*-->*
I          6220   I          20
I  *--------------------*
I  I     TEMP1 =        I
I  I  EXP(TEMP2)/2 -    I
I  I  EXP(TEMP1)/2 -    I
I  I      TEMP3         I
I  *--------------------*
I          I
I          I
I          I
I  ***INCREASEO
I  ACCIOENTS MAY NOT BE
I  NEGATIVE
I          I
I          I
I          I
I          *    21
I        *   *
I      *       *
I  FALSE *       *
I  +-----* TEMP1 .LT. 0  *
I  I       *          *
I  I         *      *
I  I           *  *
I  I            *
I  I          ITRUE
I  I            I
I  I            I
I  I            I
I  I            I
I  I            I          22
I  I  *--------------------*
I  I  I    TEMP1 = 0       I
I  I  *--------------------*
I  I            I
I  +------------>I
I               I
I  *** INCREASEO ANNUAL
I  ACCIOENTS IS FACTOREO
I  BY THE PORTION OF
I  YEAR
I   ***WHICH  THE
I  CLOSURE WAS IN EFFECT
I          I
I          I
I          I          23
I  *--------------------*
I  I TEMP5 = TEMP1/365 I
I  *--------------------*
I          I
I          I
I          I  NOTE  24
I  * * * * * * * * * * *
I  *   BEGIN DO LOOP    *
I  * 6230 IH = (BEGIN,  *
I  *       IENO          *
I  * * * * * * * * * * *
I          I
I  86.20--->I
I          I
I  ***CONVERT
I  ACCIOENTS/OAY TO
I  ACCIOENTS /HOUR
I          I
I          I
I          I          25
I  *--------------------*
I  I     TEMP1 =        I
I  I TEMP5*PCTAOT(IH,   I
I  I   7,10,1)*OAYS     I
I  *--------------------*
I          I
I          I
I          I
I  ***SET INCREASEO
I  ACCIOENTS OF OETOUR
I  ROUTE TRAFFIC TO ZERO
I          I
I          I
I          I          26
I  *--------------------*
I  I    TEMP3 = 0       I
I  *--------------------*
I          I
I          I
I          I
I  ***COMPUTE
I  OECELERATION RATE OF
I  FREEWAY MOTORIST
I          I
I          I
I          I
I          I  /
          -----
          /86.01
```

```
85.27--->*
                                   01
FACT1 =
(SPEEDN(IH)**2 +
  SPEED(IH)**2)
   /(2*SCZONE)

***IF A DELAY EXISTS
DECELERATE TO ZERO
                                   02
FALSE *  DELAY(IH)
          .GT. D
ITRUE
                                   03
FACT1 =
  SPEEDN(IH)
  **2/(2*SCZONE)

*** COMPUTE THE
INCREASE ACCIDENT
RATE DUE TO
DECELERATION
                                   04
TEMP2 = - 1.32 +
   .002*FACT1

***INCREASED
ACCIDENT MAY NOT BE
NEGATIVE
                                   05
FALSE *  TEMP2 .LT. D
ITRUE
                                   06
TEMP2 = D

*** CONVERT ACCIDENT
RATE TO ACCIDENTS
                                   07
TEMP2 =
TEMP2/1000*HVOL
(IH)*SCZONE*DAYS


***IF ALL LANES ARE
CLOSED AND NO
SHOULDERS ARE OPEN
SKIP DETOUR
                                   08
IC .NE. LANES      TRUE
IFALSE
                                   09
OVER(12,IA)        TRUE
  .GT. 0
IFALSE

***COMPUTE THE
DECELERATION RATE OF
TRAFFIC ON THE DETOUR
                                   10
FACT2 =
(SPEEDD(IH)**2 -
  SPEED(IH)**2)
   /(2*SCZONE)

***IF A DELAY EXISTS
DECELERATE TO ZERO
                                   11
FALSE *  DELAY(IH)
          .GT. D
ITRUE
                                   12
FACT2 =
  SPEEDD(IH)
**2/(2*SCZONE)

***COMPUTE THE
ACCIDENT RATE DUE TO
DECELERATION ON
DETOUR


                                   14
TEMP3 = - 1.32 +
   .002*FACT2

***ACCIDENT RATE MAY
NOT BE NEGATIVE
                                   15
TEMP3 .LT. 0       FALSE
ITRUE
                                   16
TEMP3 = 0

***CONVERT ACCIDENT
RATE TO ACCIDENTS
                                   17
TEMP3 =
TEMP3/1000*DVOL
(IH)*SCZONE*DAYS

***COMPUTE THE TOTAL
INCREASED ACCIDENTS
------86.08*-->I
6231                               18
TEMP4 = TEMP1 +
TEMP2 + TEMP3

***ACCUMULATE
ACCIDENTS FOR YEAR
                                   19
ACDTS(IC) =
ACDTS(IC) + TEMP4

6230                               20
END OF DO          NO
LOOP?
IYES             . 85 .
                 . 25 .
.75.23.
... 5001


/ 5100 /
75.27--->I
                                   21
END OF DO          NO
LOOP?
IYES             . 75 .
                 . 07 .
NOTE                               22
BEGIN DO LOOP
6050 IC = 1,
LANES

***CONVERT ACCIDENTS
FOR YEAR TO COSTS AND
HOLD BY ACTIVITY
***AND CLOSURE
                                   23
COSTS(IA,IC,3,ID)
   =
COSTS(IA,IC,3,ID)
   +
ACDTS(IC)*AACOST

***HOLD POLUTION
DAYS
                                   24
COSTS(IA,IC,7,ID)
   = POLUTF(IC)

6050                               25
NO   END OF DO
      LOOP?
IYES

***BRANCH TO
APPROPRIATE FREEWAY
TYPE
                                   26
COMPUTED GO TO
   FOR KP
5910         87.01
5920         87.09
5930         88.01

IF OUTSIDE THE RANGE

***FOUR LANE DIVIDED
/87.01
```

```
 86.26*-->*
   5910   I  NOTE  01
* * * * * * * * * * *
*     CONTINUE      *
* * * * * * * * * * *
          I
          I
          I
 ***ACCUMULATE COSTS
FOR ALL MOTOR
PARAMETERS
          I
          I
          I  NOTE  02
* * * * * * * * * * *
*    BEGIN DO LOOP  *
*    5911 J = 2, 7  *
* * * * * * * * * * *
          I
          I<------------------+
          I          03       I
*-------------------*         I
I      TEMP1 =      I         I
I COSTS(IA,1,J,ID)  I         I
*-------------------*         I
          I                   I
          I                   I
          I                   I
 ***CLOSE BOTH LANES          I
AND DETOUR TRAFFIC            I
          I                   I
          I                   I
          I          04       I
*-------------------*         I
I COSTS(IA,1,J,ID)  I         I
I        =          I         I
I COSTS(IA,2,J,ID)  I         I
*-------------------*         I
          I                   I
          I                   I
          I                   I
 ***CLOSE ONE LANE AT         I
A TIME                        I
          I                   I
          I                   I
          I          05       I
*-------------------*         I
I COSTS(IA,2,J,ID)  I         I
I     = TEMP1*2     I         I
*-------------------*         I
          I                   I
          I                   I
          I                   I
 ***TEST FOR                  I
COMPUTABLE CROSSOVER          I
          I                   I
          I                   I
          I                   I
          *   06              I
        *   *                 I
      *       *               I
    *           *  TRUE       I
  * CROSS(1) .EQ. *-+         I
    *    0      *   I         I
      *       *     I         I
        *   *       I         I
          *       ....        I
          IFALSE . 88 .       I
          I       . 12 .      I
          I       ....        I
          I       5000        I
          I                   I
          I                   I
          I                   I
 ***CLOSE BOTH LANES          I
AND CROSS OVER TO ONE         I
LANE OPEN                     I
          I                   I
          I                   I
          I          07       I
*-------------------*         I
I COSTS(IA,3,J,ID)  I  +------I------------>*
I        =          I  I      I             I
I  TEMP1*(CROSS(2)  I  I      I   5911     *   08
I  /CROSS(1))*2     I  I      I          *   *
*-------------------*  I      I        *       *
          I            I      I  NO  *           *
          I            I      +-----*  END OF DO   *
          +------------+              *  LOOP?   *
                                        *       *
                                          *   *
                                            *
                                            IYES
                                            I
                                            I
                                            I
                                            I
                                            I
                                           ...
                                          .   .
                                          .88.12.
                                          .   .
                                           ... 5000
```

```
 ***SIX LANE DIVIDED

 86.26--->*
   5920   I  NOTE  09
* * * * * * * * * * *
*     CONTINUE      *
* * * * * * * * * * *
          I
          I
          I
 ***ACCUMULATE COSTS
FOR ALL MOTOR
PARAMETERS
          I
          I
          I  NOTE  10
* * * * * * * * * * *
*    BEGIN DO LOOP  *
*    5921 J = 2, 7  *
* * * * * * * * * * *
          I
          I<------------------+
          I          11       I
*-------------------*         I
I      TEMP1 =      I         I
I COSTS(IA,1,J,ID)  I         I
I                   I         I
I      TEMP2 =      I         I
I COSTS(IA,2,J,ID)  I         I
*-------------------*         I
          I                   I
          I                   I
          I                   I
 ***CLOSE ALL THREE           I
LANES AND DETOUR              I
TRAFFIC                       I
          I                   I
          I                   I
          I          12       I
*-------------------*   +-----I------------>*
I COSTS(IA,1,J,ID)  I   I     I             I
I        =          I   I     I   ***COMPUTE CROSS
I COSTS(IA,3,J,ID)  I   I     I   OVER FACTOR FOR ONE
*-------------------*   I     I   LANE CLOSED
          I             I     I             I
          I             I     I             I
          I             I     I             I          16
 ***CLOSE TWO LANES     I     I   *-------------------*
THEN CLOSE ONE LANE     I     I   I      TEMP3 =      I
          I             I     I   I CROSS(3)/CROSS(1) I
          I             I     I   *-------------------*
          I          13 I     I             I
*-------------------*   I     I             I
I COSTS(IA,2,J,ID)  I   I     I             I
I  = TEMP2 + TEMP1  I   I     I   ***COMPUTE CROSS
*-------------------*   I     I   OVER FACTOR FOR TWO
          I             I     I   LANES CLOSED
          I             I     I             I
          I             I     I             I
 ***CLOSE ONE LANE AT   I     I             I          17
A TIME                  I     I   *-------------------*
          I             I     I   I      TEMP4 =      I
          I             I     I   I CROSS(3)/CROSS(2) I
          I          14 I     I   *-------------------*
*-------------------*   I     I             I
I COSTS(IA,3,J,ID)  I   I     I             I
I     = TEMP1*3     I   I     I             I
*-------------------*   I     I   ***CLOSE ALL THREE
          I             I     I   LANES AND CROSS OVER
          I             I     I   TO ONE LANE OPEN
          I             I     I             I
 ***TEST FOR            I     I             I
COMPUTABLE CROSSOVER    I     I             I          18
          I             I     I   *-------------------*
          I             I     I   I COSTS(IA,4,J,ID)  I
          I             I     I   I  = TEMP1*TEMP3 +  I
          *   15        I     I   I    TEMP2*TEMP4    I
        *   *           I     I   *-------------------*
      *       *         I     I             I
    *           *  TRUE I     I             I
  * CROSS(2) .EQ. *-+   I     I             I
    *    0      *   I   I     I   5921     *   19
      *       *     I   I     I          *   *
        *   *       I   I     I        *       *
          *       ....  I     I  NO  *           *
          IFALSE . 88 . I     +-----*  END OF DO   *
          I       . 12 .I             *  LOOP?   *
          I       ....  I               *       *
          I       5000  I                 *   *
          I             I                   *
          I             I                   IYES
          +-------------+                   I
                                            I
                                            I
                                            I
                                            I
                                            I
                                           ...
                                          .   .
                                          .88.12.
                                          .   .
                                           ... 5000
```

```
 ***EIGHT LANE
DIVIDED

 86.26--->*
   5930   I  NOTE  01
* * * * * * * * * * *
*      CONTINUE      *
* * * * * * * * * * *
          I
          I
          I
 ***ACCUMULATE COSTS
FOR ALL MOTOR
PARAMETERS
          I
          I
          I  NOTE  02
* * * * * * * * * * *
*   BEGIN DO LOOP    *
*   5931 J = 2, 7    *
* * * * * * * * * * *
          I
 88.11--->I
          I        03
*--------------------*
I      TEMP1 =       I
I COSTS(IA,1,J,ID)   I
I                    I
I      TEMP2 =       I
I COSTS(IA,2,J,ID)   I
*--------------------*
          I
          I
          I
 ***CLOSE ALL FOUR        +------------------->*
LANES AND DETOUR          I                    I
TRAFFIC                   I                    *    09
          I               I                  *   *
          I               I                *       *
          I        04     I          TRUE *          *
*--------------------*    I     +------* CROSS(2) .EQ. *
I COSTS(IA,1,J,ID)   I    I     I        *    0      *
I        =           I    I     I          *       *
I COSTS(IA,4,J,ID)   I    I     I            *   *
*--------------------*    I     I              *
          I               I     I              IFALSE
          I               I     I              I
          I               I     I              I
 ***CLOSE THREE LANES     I     I              I
THEN CLOSE ONE LANE       I     I--------------I
          I               I     I              I
          I               I     I              I
          I        05     I     I    ***CLOSE ALL FOUR
*--------------------*    I     I   LANES AND CROSS OVER
I COSTS(IA,2,J,ID)   I    I     I   TO TWO LANES
I        =           I    I     I              I
I COSTS(IA,3,J,ID)   I    I     I              I
I      + TEMP1       I    I     I              I        10
*--------------------*    I     I   *--------------------*
          I               I     I   I COSTS(IA,5,J,IO)   I
          I               I     I   I        =           I
          I               I     I   I  TEMP2*(CROSS(4)   I
 ***CLOSE TWO LANES       I     I   I   /CROSS(2))*2     I
AT A TIME                 I     I   *--------------------*
          I               I     I              I
          I               I     I              I
          I        06     I     I              I
*--------------------*    I     I      5931    *    11
I COSTS(IA,3,J,ID)   I    I     I            *   *
I    = TEMP2*2       I    I     I          *       *
*--------------------*    I     I        *           *   NO
          I               I     I      *   END OF DO   *-+
          I               I     I        *   LOOP?   *   I
          I               I     I          *       *     I
 ***CLOSE ONE LANE AT     I     I            *   *       I
A TIME                    I     I              *       ....
          I               I     I              IYES    . 88 .
          I               I     I              I       . 03 .
          I        07     I     I              I       ....
*--------------------*    I     I              I
I COSTS(IA,4,J,ID)   I    I     I              I
I     = TEMP1*4      I    I     +----75.03*--->I
*--------------------*    I                    I
          I               I            5000    *    12
          I               I                  *   *
          I               I                *       *
 ***TEST FOR              I              *           *   NO
COMPUTABLE CROSSOVER      I            *   END OF DO   *-+
          I               I              *   LOOP?   *   I
          I               I                *       *     I
          +---------------+                  *   *       I
                                               *       ....
                                               IYES    . 75 .
                                               I       . 03 .
                                               I       ....
                                               I
                                               I
                                               I
                                               I 13
                                           ---------
                                           *  EXIT  *
                                           ---------
```

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