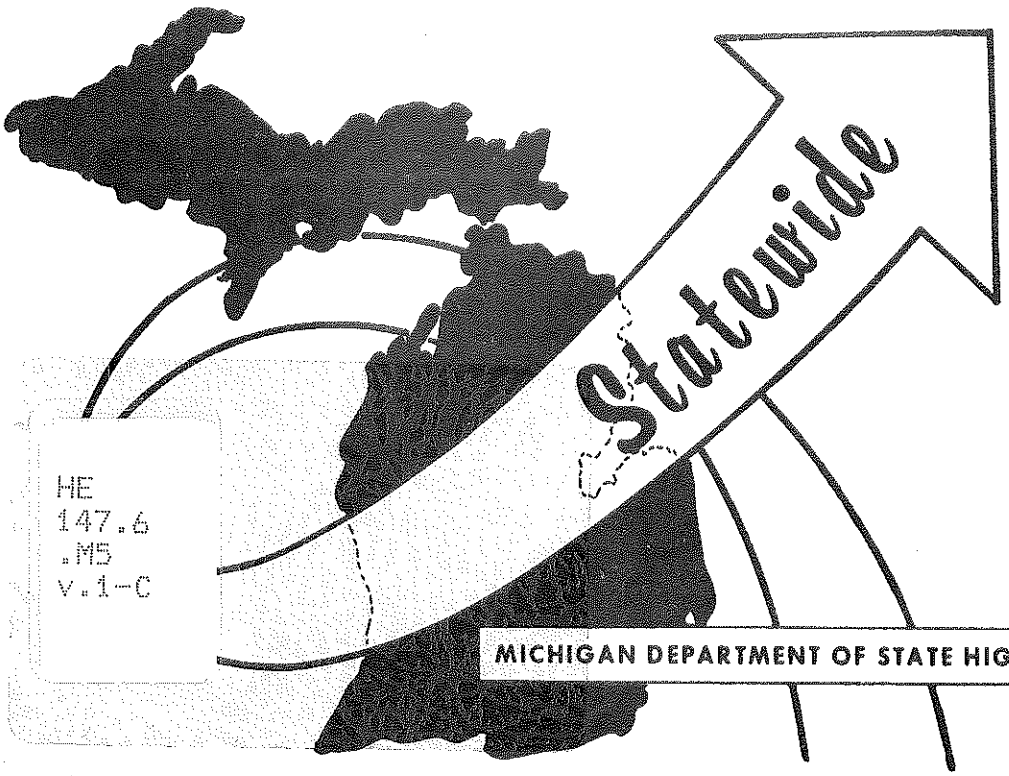
Statewide Transportation Analysis & Research

MICHIGAN'S
STATEWIDE TRAFFIC FORECASTING
MODEL

VOLUME I-C

MODEL APPLICATION
TURNBACKS

OCTOBER, 1972



MICHIGAN DEPARTMENT OF STATE HIGHWAYS AND TRANSPORTATION

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OCTOBER, 1972

STATE OF MICHIGAN

WILLIAM G. MILLIKEN, GOVERNOR

DEPARTMENT OF STATE HIGHWAYS

STATE HIGHWAYS BUILDING - POST OFFICE DRAWER K - LANSING, MICHIGAN 48904
HENRIK E. STAFSETH, DIRECTOR

October 27, 1972

Mr. Sam F. Cryderman
Engineer of Transportation Planning
Transportation Planning Division

Dear Mr. Cryderman:

The Statewide Studies Unit has examined the feasibility of using the statewide model to improve upon present methods of analysis for trunkline turnback studies. This report includes discussions of two computerized processes -- one applicable to classification type turnbacks and the other process applicable to turnbacks due to relocation. Output is in the form of computer listings and plots.

The results of test studies on M-73 as a sample classification type turnback and on M-37 as a relocation type turnback seem encouraging. We have made no recommendations on these trunklines, but, rather submit these test results for display only.

This report was prepared by Richard A. Nelson under the supervision of Richard E. Esch, Supervisor, Statewide Studies Unit.

We anticipate that the processes discussed herein will provide detailed analysis of travel characteristics, more quickly, and for fewer man-hours than the present manual analysis process.

Sincerely,

Keith E. Bushnell

Keith E. Bushnell
Engineer of Transportation
Survey and Analysis Section

MICHIGAN
THE GREAT LAKE STATE

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INTRODUCTION

INTRODUCTION

The present turnback law explicitly states that agreement must be reached between the Michigan Department of State Highways and the local governmental unit regarding a change in jurisdiction in the state trunkline system. Significant effort has been expended by the Department to achieve a smooth running turnback program. In making its decision, the Department must consider the level and character of service, using the latest standards and criteria (accepted and recognized) available. Within these guidelines, the impact of the proposed turnback on state, regional and local master plans must be considered.

This report describes how existing technology, used in conjunction with the statewide traffic forecasting model, can be used to provide a systematic and factual basis for evaluating the present level and character of service for any proposed trunkline establishment or abandonment.

This process will now allow the Department to concentrate a major portion of its effort on systems analysis and evaluation rather than data manipulation and summarization.

Application of the system analysis techniques alluded to in this report will allow the Department to effectively supply a thorough evaluation of each trunkline turnback and its impact on state, regional and local master plans.

As a matter of clarity, the report has been divided into two sections. The first deals with classification turnbacks and the second with relocation turnbacks.

CLASSIFICATION TURNBACKS

CLASSIFICATION TURNBACKS

State trunklines typically preform at certain levels of service and each segment of road also has specific travel characteristics associated with it. One of the measures of travel characteristics on each segment of road is the length of each trip. Trip length measurements are a reliable indicator of the amount of "local" traffic using a specific facility. Further discussion of this topic is available in the 1968 National Functional Classification Manual. When it appears that a trunkline may not be performing in a manner similar to "typical" state trunklines, then it should become a candidate for turnback due to "classification". If the change is such that the route is carrying more "local" travel than state trunkline standards then it may be reclassified and transferred to local jurisdiction.

As a result of the development of systematic factual trunkline turnback analysis process the department will now be able to ensure a fair and equitable transfer of highways. The chance of a decision by arbitration may also be greatly reduced as a direct result of the thoroughness of the proposed evaluation process.

As proposed, the "classification turnback" process depends primarily on the Single Station Origin-Destination Travel Analysis Process. The 547 Zone Statewide Traffic Forecasting Model serves as the analysis base for this process. The only input required to complete a "classification turnback" analysis is single station origin-destination data.

Some of the evaluation methods are no different than present techniques except that the complete process is automated which should result in three basic advantages:

1. Fewer man-hours on data manipulation and summarization.
2. Evaluation consistency from project to project.
3. System analysis instead of project analysis.

Because the analysis process is being intergrated with the Statewide Traffic Forecasting Model all of the travel characteristic analysis reports are presented graphically. This results in two additional advantages over present techniques.

1. Elimination of preparation of graphics for final analysis reports.
2. Instant access to analysis information.

Application of the "classification turnback" analysis process results in five standard travel-characteristic-analysis reports as indicated below:

1. Trip Purpose Analysis Report which indicates whether a route is primarily a recreational or non-recreational route.
2. Trip Origin-Destination Summary Matrix which supplies information on the origin and destination of each vehicle using a segment of road.
3. Trip End Distribution Analysis Diagram which shows the origin or destination of all vehicles using a

specified route. This diagram also indicates the probable route used to arrive at the study site.

4. Trip Length Distribution Analysis Report which will allow the user to establish the average trip length on the segment of road under study. This report also determines what percent of the travel on the route occurs for each travel length classification.

5. System Analysis Report which determines the impact a proposed trunkline turnback may have relative to all other existing state trunklines.

This analysis process was tested using M-73 single station origin-destination data as input. Travel analysis results are expressed in terms of the 547 zone statewide model system as previously indicated. A diagram of the 547 travel analysis zones used for the test appears in Figure 1. Figure 2 is an M-73 area map showing the test trunkline in red. Note, that this and subsequent figures may lack clarity due to their reduction to 8 1/2 x 11 for this report. However, listings and plots may be reproduced at any desired scale to improve legibility during the actual analysis process.

The five basic "classification turnback" travel-characteristic-analysis reports follow Figure 2. A detailed explanation of each report accompanies the analysis diagram.

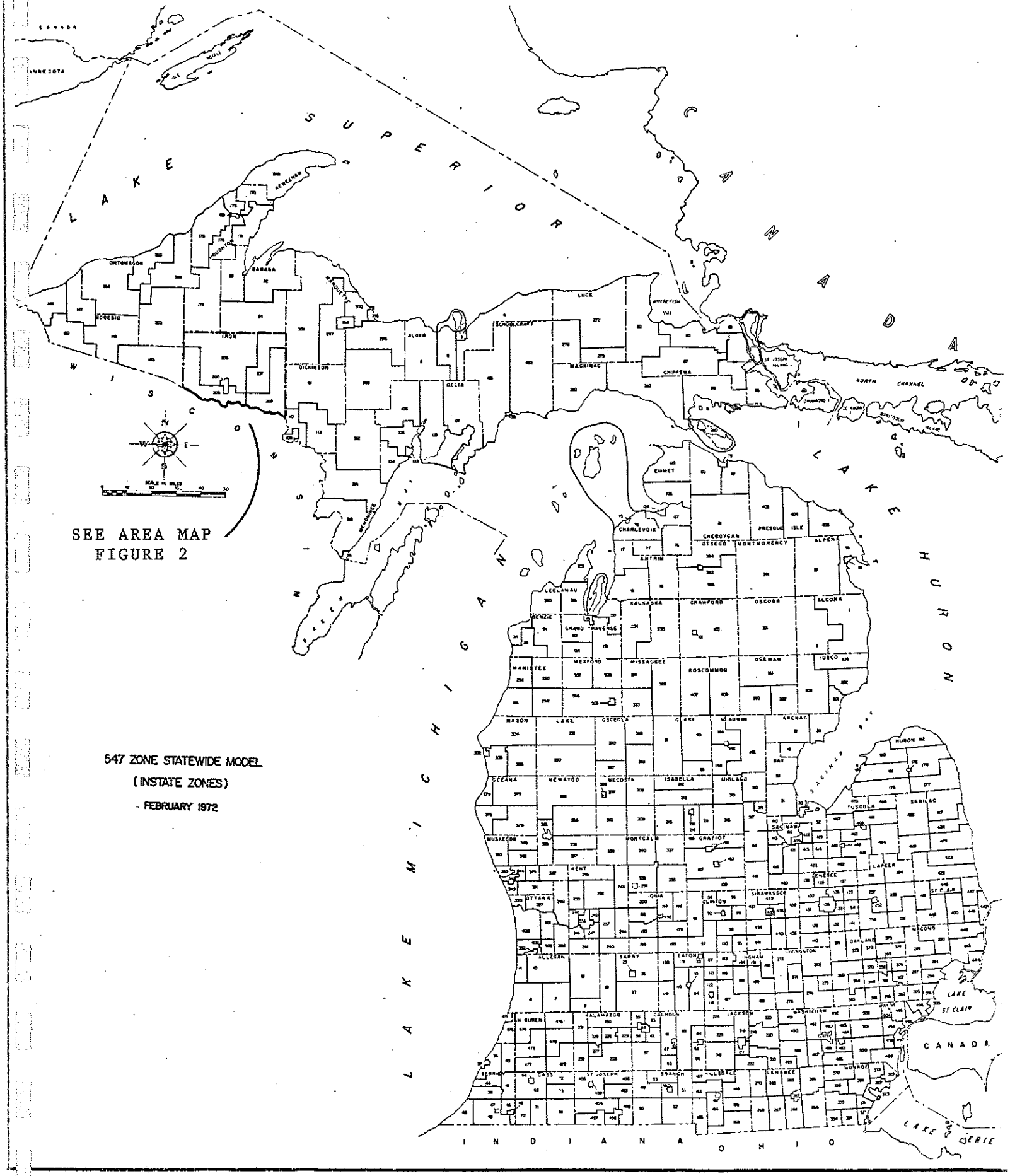

SEE AREA MAP
FIGURE 2
547 ZONE STATEWIDE MODEL
(INSTATE ZONES)
- FEBRUARY 1972
LAKE SUPERIOR
LAKE MICHIGAN
LAKE HURON
LAKE ST CLAIR
LAKE ERIE
CANADA
INDIANA
OHIO

FIGURE 1

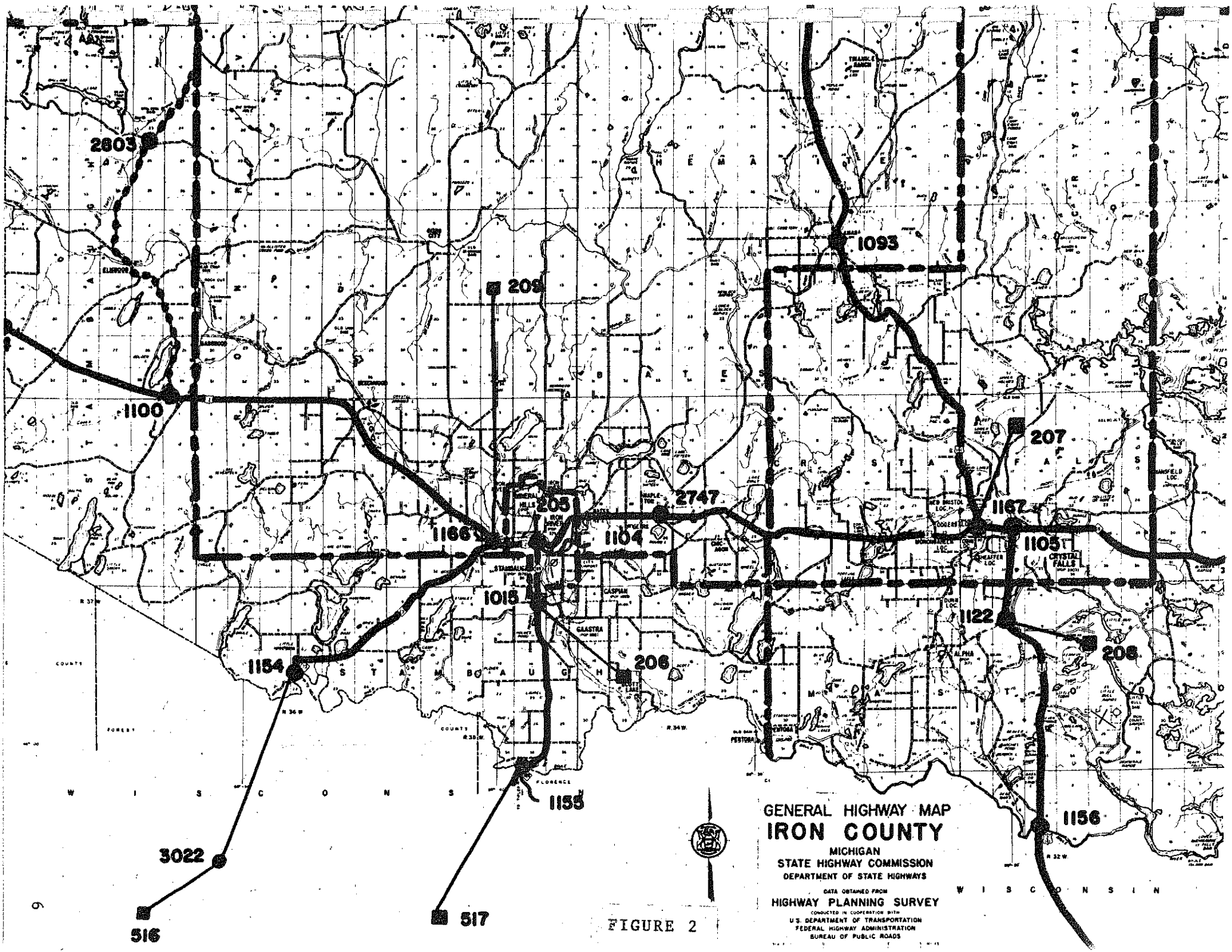
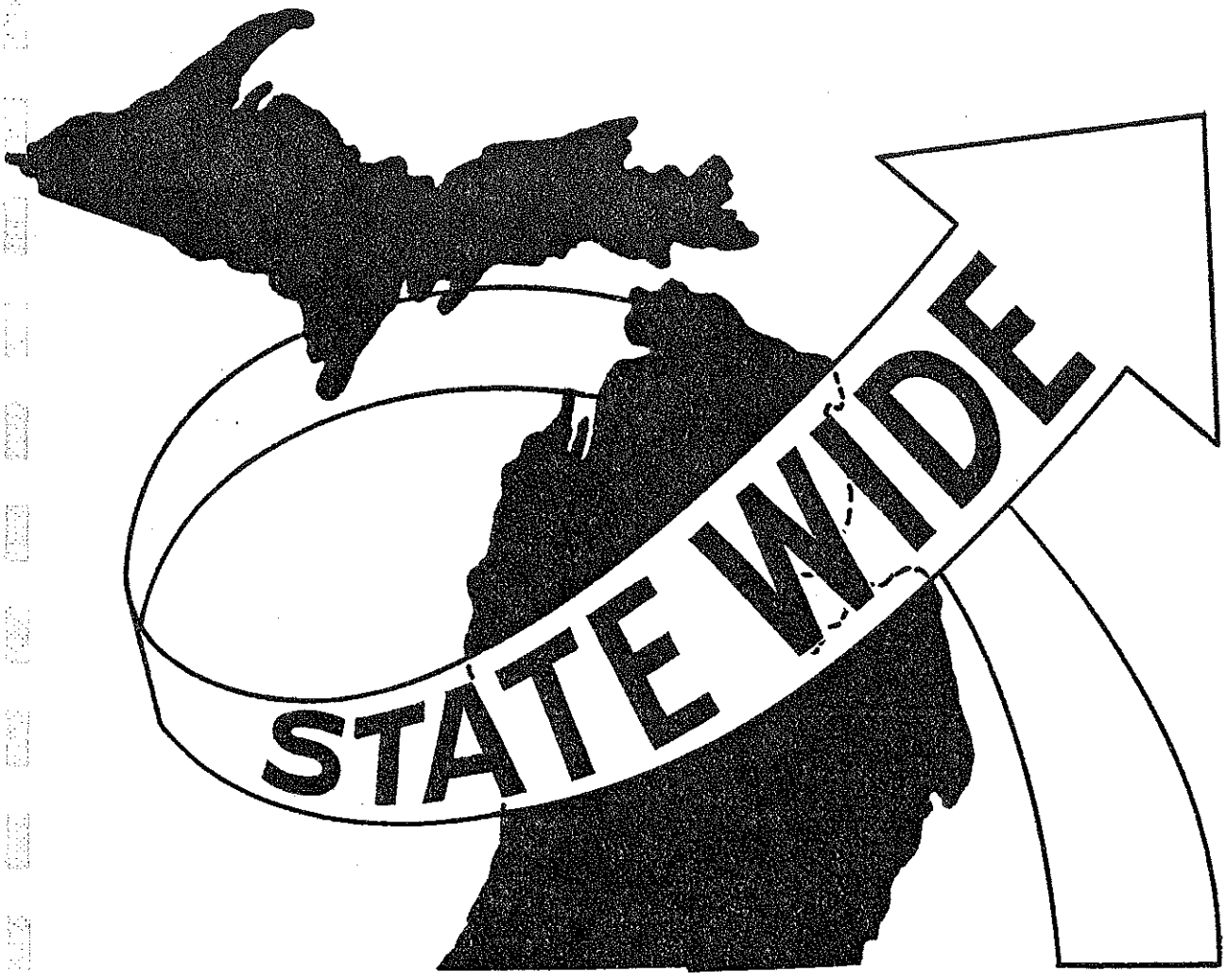

2803
1100
205
1093
207
1166
2747
1104
1105
1167
1015
1122
206
1154
1155
1156
3022
516
517
GENERAL HIGHWAY MAP
IRON COUNTY
MICHIGAN
STATE HIGHWAY COMMISSION
DEPARTMENT OF STATE HIGHWAYS
DATA OBTAINED FROM
HIGHWAY PLANNING SURVEY
CONDUCTED IN COOPERATION WITH
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
BUREAU OF PUBLIC ROADS
WISCONSIN

FIGURE 2

The first travel analysis report is a general summary of trips by six standard trip purposes and eight standard vehicle types. Figure 3 shows the format and the general purpose summary program output. Also note the explanation of how to interpret this output.



FORM NUMBER = S

VEHICLE TYPE

RANGES		1	2	3	4	5	6	7	8	TOTAL
	1	1	2	3	4	5	6	7	8	TOT %
	1	85.10	25.30	20.70	2.30	4.60	0.00	2.30	0.00	140.30
	1	60.66	18.03	14.75	1.64	3.28	0.00	1.64	0.00	34.66
		26.06	52.38	100.00	100.00	100.00	0.00	100.00	0.00	
T		21.02	6.25	5.11	0.57	1.14	0.00	0.57	0.00	
R	2	18.40	2.30	0.00	0.00	0.00	0.00	0.00	0.00	20.70
	2	88.89	11.11	0.00	0.00	0.00	0.00	0.00	0.00	5.11
I		5.63	4.76	0.00	0.00	0.00	0.00	0.00	0.00	
		4.55	0.57	0.00	0.00	0.00	0.00	0.00	0.00	
P										
	3	39.10	6.90	0.00	0.00	0.00	0.00	0.00	0.00	46.00
	3	85.00	15.00	0.00	0.00	0.00	0.00	0.00	0.00	11.36
		11.97	14.29	0.00	0.00	0.00	0.00	0.00	0.00	
P		9.66	1.70	0.00	0.00	0.00	0.00	0.00	0.00	
U	4	43.70	2.30	0.00	0.00	0.00	0.00	0.00	0.00	46.00
	4	95.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	11.36
R		13.38	4.76	0.00	0.00	0.00	0.00	0.00	0.00	
		10.80	0.57	0.00	0.00	0.00	0.00	0.00	0.00	
P										
	5	140.30	11.50	0.00	0.00	0.00	0.00	0.00	0.00	151.80
O	5	92.42	7.58	0.00	0.00	0.00	0.00	0.00	0.00	37.50
		42.96	23.81	0.00	0.00	0.00	0.00	0.00	0.00	
S		34.66	2.84	0.00	0.00	0.00	0.00	0.00	0.00	
	TOTAL	326.60	48.30	20.70	2.30	4.60	0.00	2.30	0.00	404.80
	TOT %	80.68	11.93	5.11	0.57	1.14	0.00	0.57	0.00	

TOTAL RECORDS READ = 176
TOTAL RECORDS DROPPED = 0
TOTAL RECORDS MISSED = 0

FIGURE 3

THIS TABLE IS BASED ON THE FOLLOWING KEY SELECTION

FORM NUMBER = COLUMNS 1, 1

V E H I C L E T Y P E

RANGES	1 1	2 2	3 3	4 4	5 5	6 6	7 7	8 8	TOTAL TOT %
T R I P P U R P O S E 1	1 ROW % COL % TOT %								
2	2 ROW % COL % TOT %								
3	3 ROW % COL % TOT %								
4	4 ROW % COL % TOT %								
5	5 ROW % COL % TOT %								
6	6 ROW % COL % TOT %								
TOTAL	TOT %								

Figure 3 shows the distribution of through trips by vehicle type and trip purpose.

The vehicle type codes are:

1 = Passenger cars without trailer
2 = Passenger cars with trailer
3 = Panel or pickup trucks without trailer
4 = Panel or pickup with trailer
5 = Other (larger) single unit trucks
6 = Truck combinations
7 = Buses
8 = Motorcycles

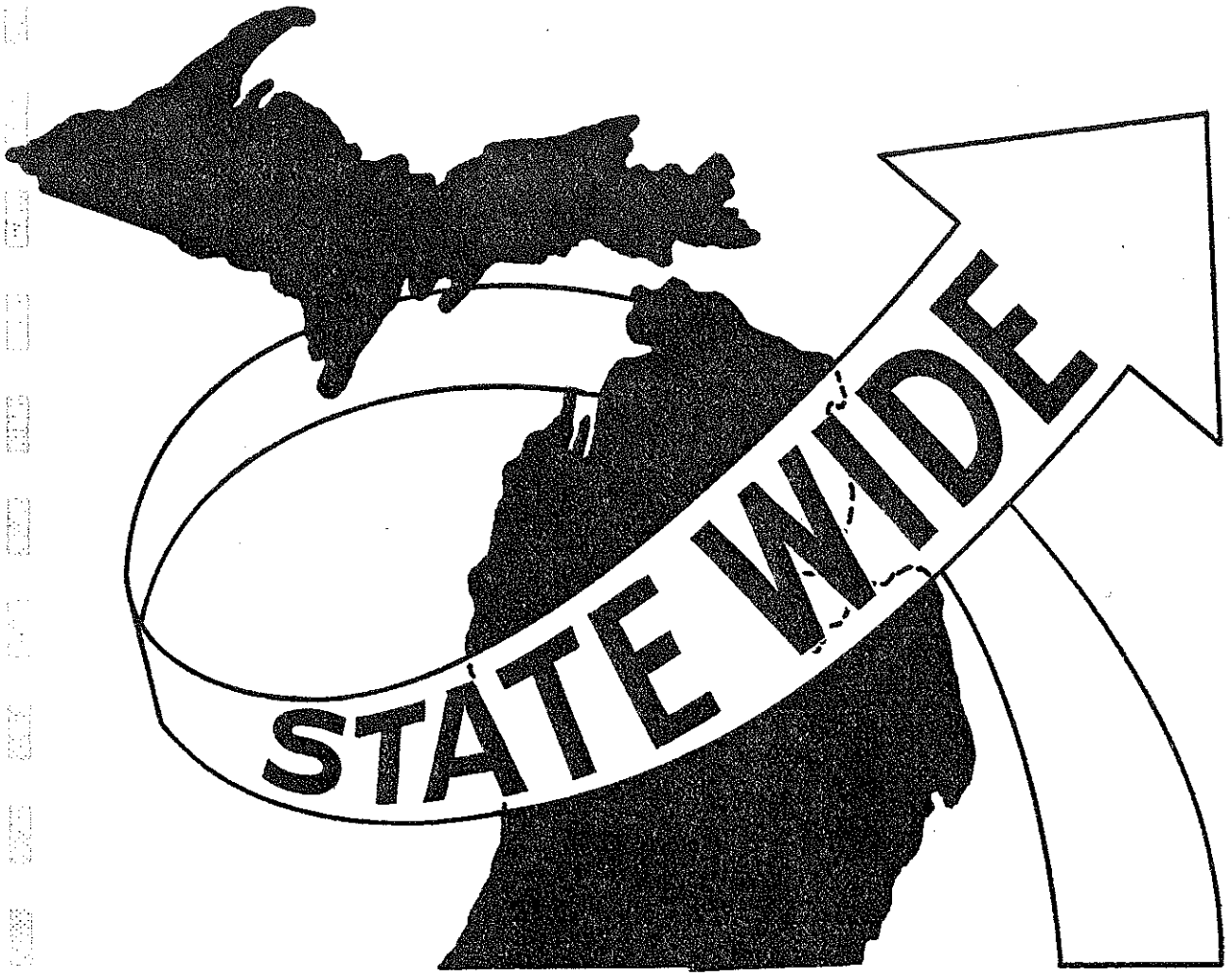
The trip purpose codes are:

1 = Work
2 = Personal business
3 = Shopping
4 = Vacation
5 = Other social or recreation
6 = All other

FACTOR TO	LOCATION FROM	LOCATION TO	OPERATION	CONSTANT
24-HOUR FACTOR	197	200	1	0.01000

The sample cell outlined above represents 140.30 trips which were social-recreation (5) trips made by passenger cars without trailers (1). This first figure in each cell will always be the raw number of trips. The next figure indicates that 92.42 percent of the trips with trip purpose 5 were passenger cars without trailers. The next figure indicates that 42.96 percent of the trips with vehicle type 1 were social-recreation trips. The last figure in the cell indicates that 34.66 percent of all trips in the table were of this type (i.e. vehicle type = 1 and trip purpose = 5). The row total at the right shows that 151.80 trips or 37.50 percent were social-recreation trips (trip purpose = 5). The column total at the bottom left shows that 326.60 trips or 80.68 percent were passenger cars without trailers (vehicle type = 1). The total number of trips (404.80) in this table is indicated at the lower right.

The second report is a trip table of actual trips among all statewide model zones. This trip table will necessarily include only trips using M-73. Figure 4 is a sample of these trip tables.



30DEC71 M-73 TURNBACK STUDY TRIP TABLES BY STWD ZONES PAGE 302

INTERCHANGE VALUES FROM ZONE 301 TO ALL OTHER ZONES TABLES NUMBER 101

	0	1	2	3	4	5	6	7	8	9
0			0	0	0	0	0	0	0	0	0
52		0	[7]	0	0	0	0	0	0	0	0

TOTAL = 7 MEAN = 0.013

30DEC71 M-73 TURNBACK STUDY TRIP TABLES BY STWD ZONES PAGE 210

INTERCHANGE VALUES FROM ZONE 209 TO ALL OTHER ZONES TABLES NUMBER 101

	0	1	2	3	4	5	6	7	8	9
0			0	0	0	0	0	0	0	0	0
51		0	0	0	0	0	0	35	81	0	0
52		0	16	0	9	2	2	0	0	0	0

TOTAL = 145 MEAN = 0.265

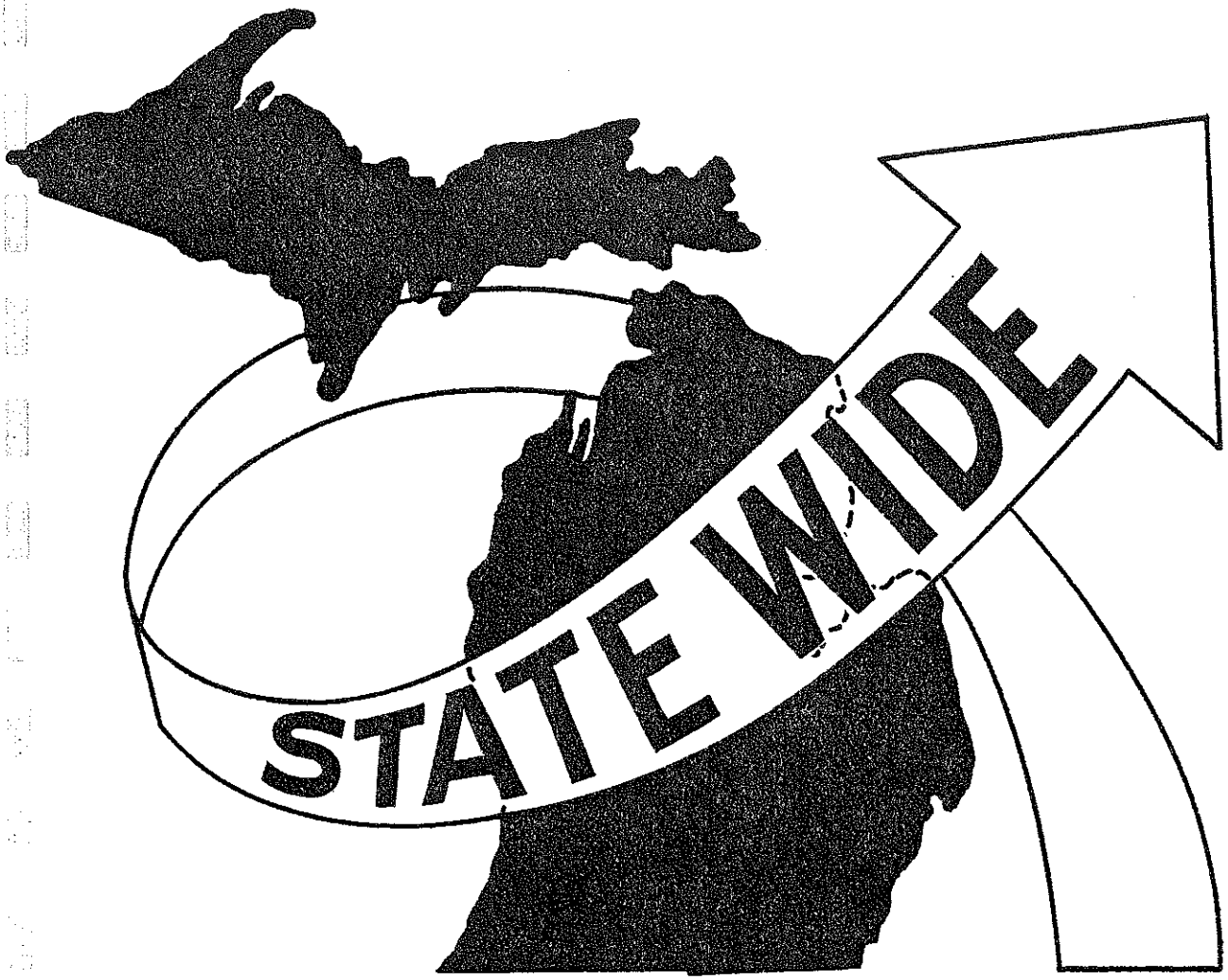
NOTE:

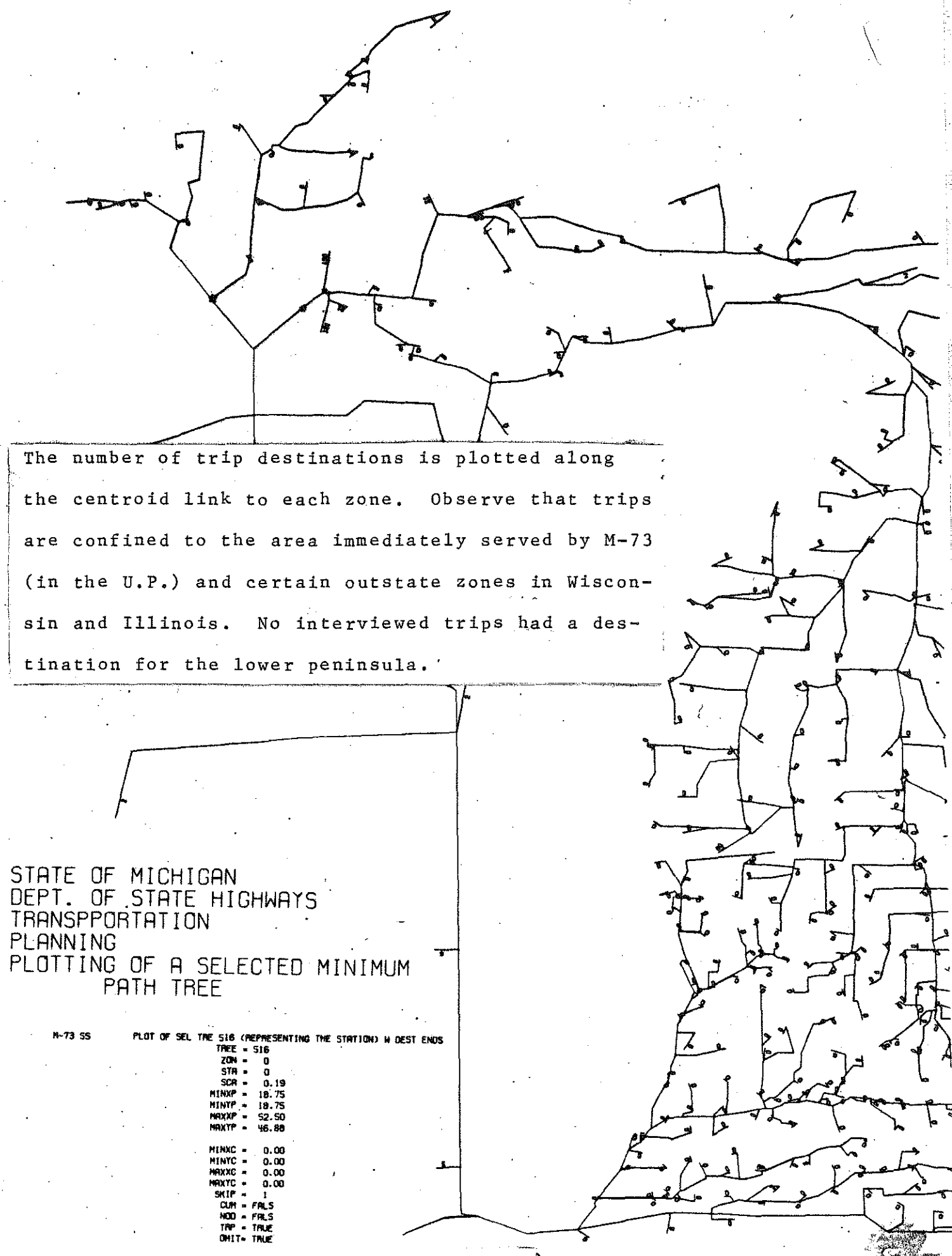
These tables are only selected samples of the trip interchange from each zone to every other zone. The absence of large numbers of trips and the limited distribution of trips is due to the low ADT and relatively local service of M-73.

The sample cell outlined indicates that (7) trips, interviewed at the station on M-73, interchanged between zone 301 and zone 521.

FIGURE 4

The third report (trip end plot) is a plot of the minimum travel time highway route from the zone nearest the station to every other zone, Figure 5. The trip end values (either origins or destinations) may also be plotted. The numeric values along the centroid links are trip destinations that actually used that portion of M-73.



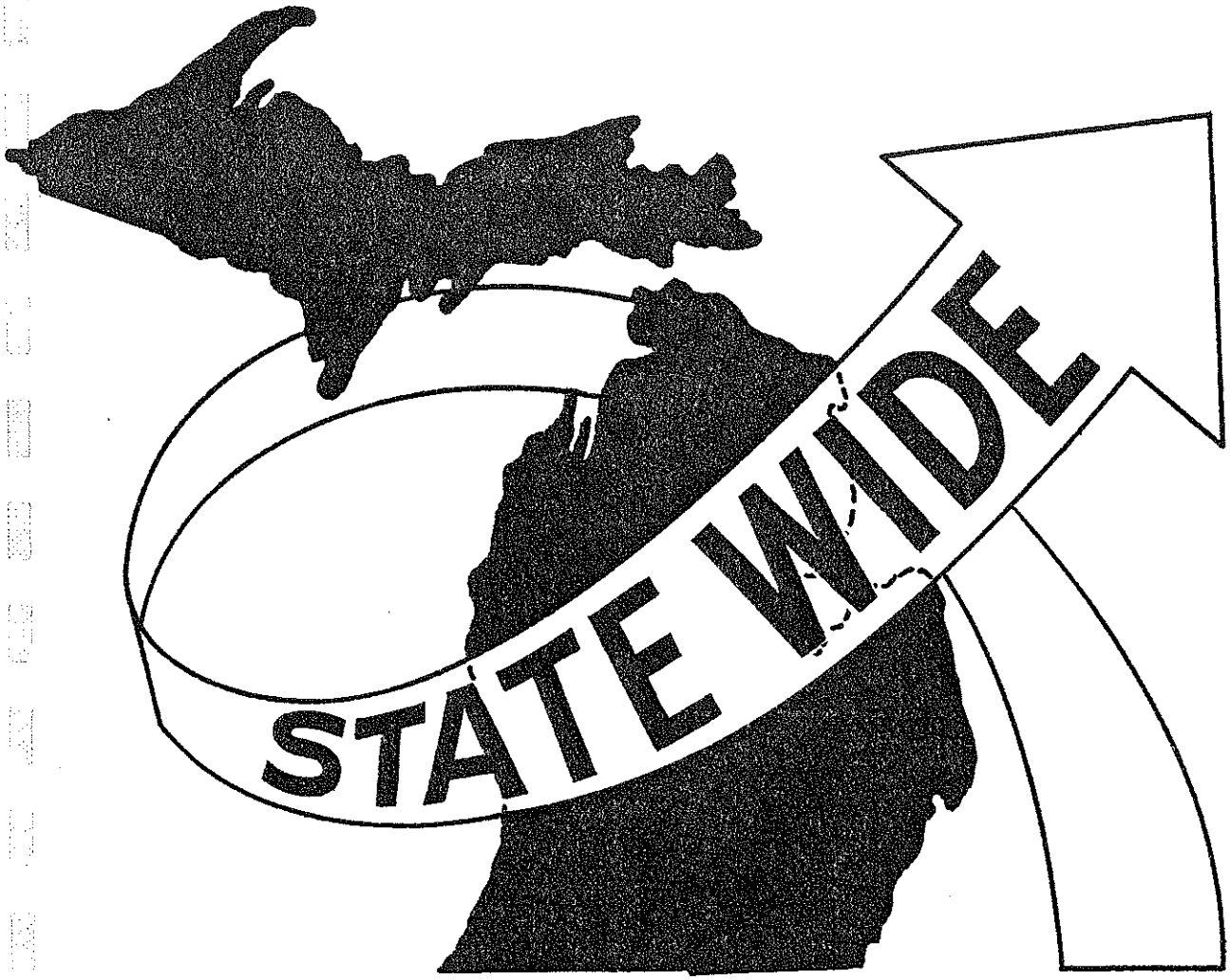


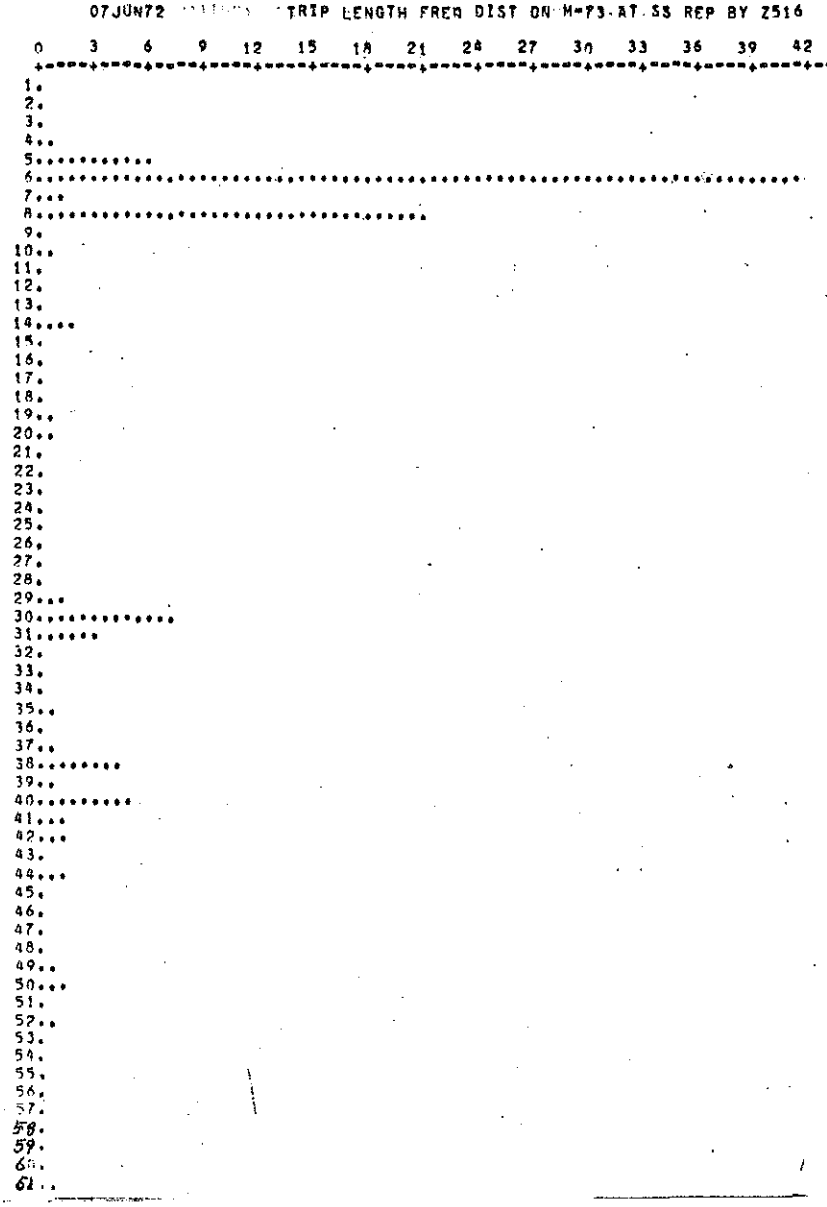
The number of trip destinations is plotted along the centroid link to each zone. Observe that trips are confined to the area immediately served by M-73 (in the U.P.) and certain outstate zones in Wisconsin and Illinois. No interviewed trips had a destination for the lower peninsula.

FIGURE 5

The fourth report is a trip length-frequency distribution diagram. It graphically presents the distribution of trips by travel time minutes. This single graph actually allows the department to determine to what extent short or long distance travel dominates a route. A trip length frequency distribution for M-73 appears in Figure 6.

> Note: Program options also permit the plotting of trip length-frequency distribution diagrams using distance rather than time (along the minimum time path). Using the distance as "trip length", the vertical axis and the statistical summaries, such as the mean, would represent miles rather than minutes.





	P.C.	CUM.	ACTUAL
1.	0.000	0.000	0
2.	0.000	0.000	0
3.	0.000	0.000	0
4..	0.500	0.500	2
5..........	5.750	6.250	23
6..........	41.500	47.750	166
7...	1.000	48.750	4
8..........	21.000	69.750	84
9.	0.000	69.750	0
10..	0.500	70.250	2
11.	0.000	70.250	0
12.	0.000	70.250	0
13.	0.000	70.250	0
14....	1.750	72.000	7
15.	0.000	72.000	0
16.	0.000	72.000	0
17.	0.000	72.000	0
18.	0.000	72.000	0
19..	0.500	72.500	2
20..	0.500	73.000	2
21.	0.000	73.000	0
22.	0.000	73.000	0
23.	0.000	73.000	0
24.	0.000	73.000	0
25.	0.000	73.000	0
26.	0.000	73.000	0
27.	0.000	73.000	0
28.	0.000	73.000	0
29...	1.250	74.250	5
30..........	7.000	81.250	28
31.....	2.750	84.000	11
32.	0.000	84.000	0
33.	0.000	84.000	0
34.	0.000	84.000	0
35..	0.500	84.500	2
36.	0.000	84.500	0
37..	0.500	85.000	2
38........	4.000	89.000	16
39..	0.500	89.500	2
40........	4.500	94.000	18
41...	1.000	95.000	4
42...	1.000	96.000	4
43.	0.000	96.000	0
44...	1.000	97.000	4
45.	0.000	97.000	0
46.	0.000	97.000	0
47.	0.000	97.000	0
48.	0.000	97.000	0
49..	0.500	97.500	2
50...	1.000	98.500	4
51.	0.000	98.500	0
52..	0.500	99.000	2
53.	0.000	99.000	0
54.	0.000	99.000	0
55.	0.000	99.000	0
56.	0.000	99.000	0
57.	0.000	99.000	0
58.	0.000	99.000	0
59.	0.000	99.000	0
60.	0.000	99.000	0
61..	0.500	99.500	2
62.	0.000	99.500	0
63.	0.000	99.500	0
64.	0.000	99.500	0
65.	0.000	99.500	0
66.	0.000	99.500	0
67.	0.000	99.500	0
68.	0.000	99.500	0
69.	0.000	99.500	0
70.	0.000	99.500	0
71..	0.500	100.000	2

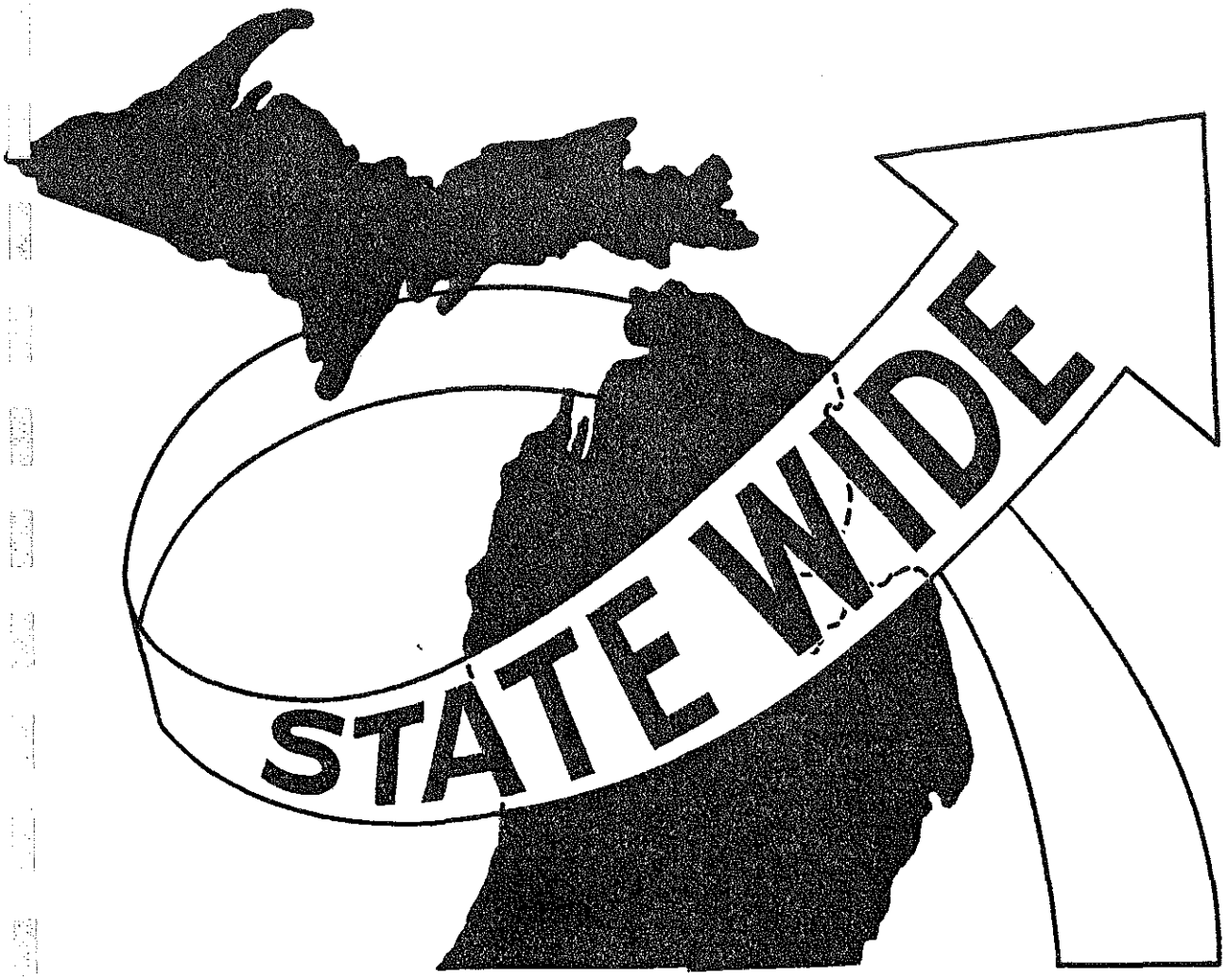
REMAINING VALUES ARE ALL ZERO
NUMBER OF OBSERVATIONS= 400 SUM= 6065. MEAN= 15.162 VAR= 206.641 SD= 14.375

TOTAL TRIPS OVER MAXP = 0
TOTAL TRIPS OVER 255 = 0
VOLUME TABLE NUMBER = 201
SKIM TREE NUMBER = 101

NOTE:

The vertical axis represents travel time grouped in tens of minutes. The horizontal axis is the percent of trips traveling this length of time. The more precise percent (to the thousandths) is listed in the column headed "P.C.". The cumulative percentage of trips is listed in the column headed "CUM.".

The fifth report is a plot of the 547 zone statewide network with only trips passing through the single station loaded onto the system. It shows volumes decreasing on a link by link basis away from the station due to trips disbursing to the closest zones. See Figure 7. A diagram of the loaded single station data will allow management to better determine the effect a single route reclassification may have on other trunklines.



SINGLE STATION TRIPS
LOADED ON STATEWIDE NETWORK

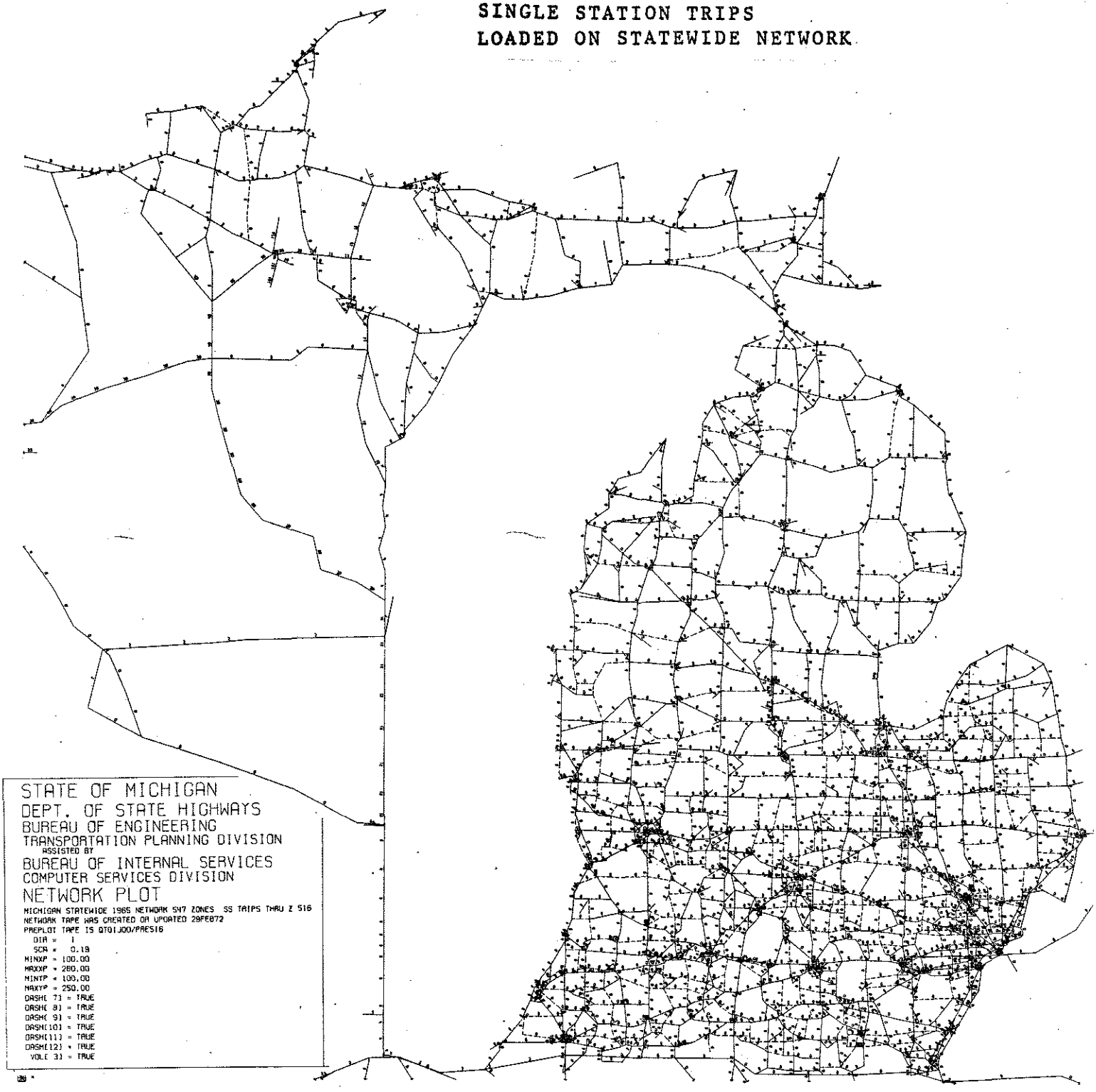


FIGURE 7

For a more detailed discussion of the actual analysis process used to produce the five standard analysis reports, refer to the Single Station O & D Procedures Manual. Reference copies are available from the Statewide Studies Unit, Transportation Survey and Analysis Section, Transportation Planning Division.

The Classification Turnback Analysis Process just discussed, could also be used to produce a current list of "classification" turnbacks as numerous sections of state trunkline are presently being considered for classification turnback. Perhaps this process should be applied to trunklines which are of at least "questionable" service as a state trunkline. If this analysis process were expanded, the Michigan Department of State Highways could monitor travel characteristics on most sections of the entire trunkline system on a yearly basis.

The travel-characteristic-analysis reports may then show that a section of state trunkline in question has a travel-characteristics profile commensurate with that of a typical county road, the state would have adequate justification for turning it back to local jurisdiction. After characteristics analysis profiles have been completed on several sections of trunkline, priorities for turnback based upon level and character of service could easily be determined.

Carrying this technique one step further, some trunklines now under consideration for turnback due to present travel characteristics may in fact be of greater importance as trunkline in the future. In this case the statewide traffic forecasting model could be used to furnish traffic projections

for any desired year. The model may also be used to supply future travel-characteristic analysis and as a result of this analysis, the department may be able to maintain a more efficient trunkline system.

RELOCATION
TURNBACKS

STATEWIDE MODEL APPLICATIONS TO TURNBACKS DUE TO RELOCATION

The department is confronted with a different type of problem determining the future of state trunklines near a proposed new facility. Should the old trunkline be maintained as a trunkline in the future, or should the old trunkline be turned back to local jurisdiction. Possibly only sections of the route should be obliterated, and if this is so, the character and level of service the old road will have at the time the new facility is opened to traffic must be determined.

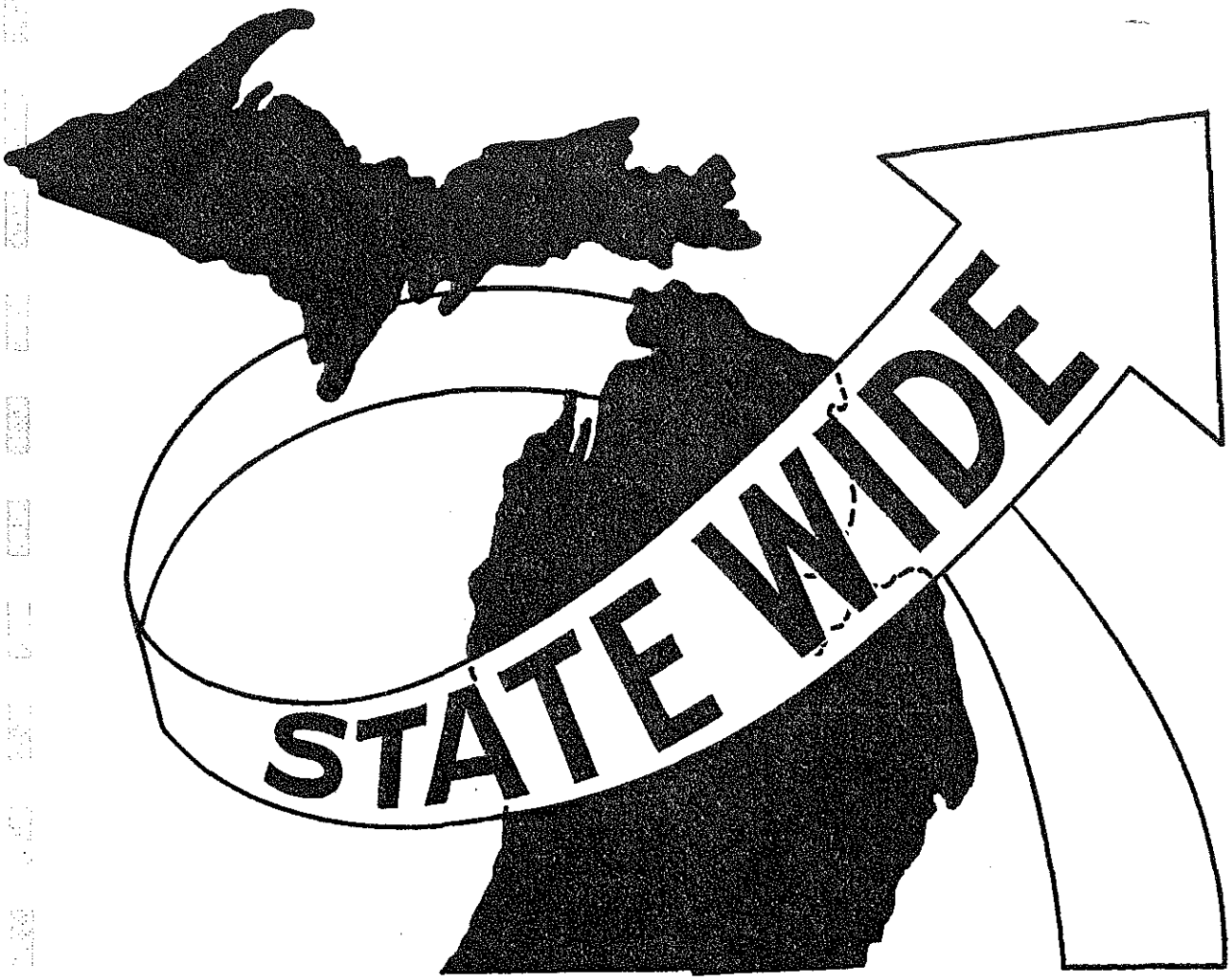
Up until now the department has had no satisfactory way of predicting travel characteristics on either the new or the old facility and maintain consistency from one project to the next. Recently the statewide model has been utilized to predict traffic on several proposed alternate routes. The same process used to predict traffic may also be used to predict future travel characteristics. The traffic forecasting model process will allow the department to monitor the impact of any future trunkline addition or deletion on the total system or any individual section. This traffic assignment process consists of three elements: the travel matrix, the highway network and the assignment process. With a calibrated statewide travel simulation model these three elements interact to reproduce the predicted level of service and travel characteristics on the existing highway system or any proposed system.

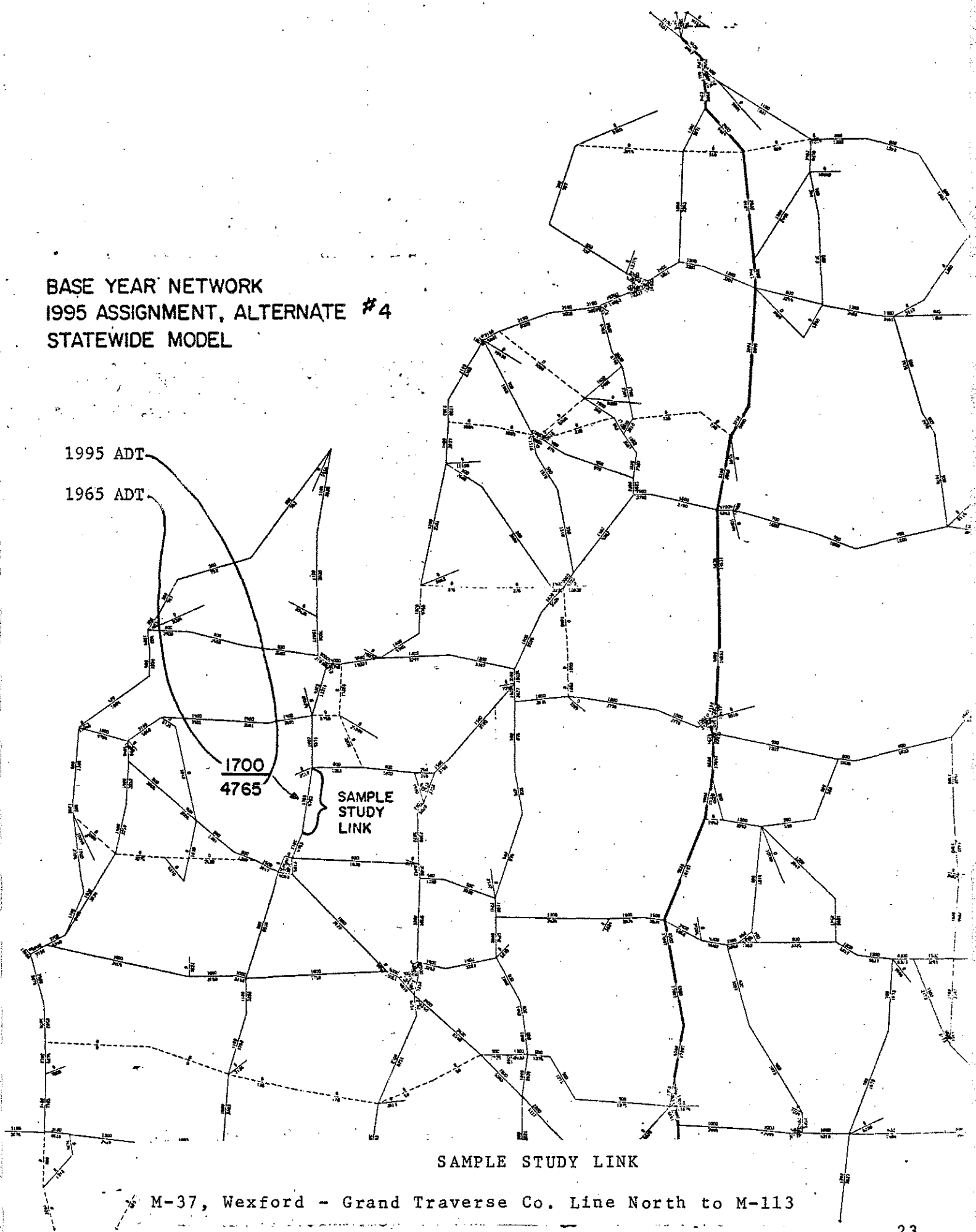
The location and alignment of the new facility, type of facility, location of interchanges etc. will have profound effects upon traffic on the old trunkline. These effects can now be monitored on each successive alternate corridor assignment and can even be a consideration when deciding upon the new route's location. This ability to monitor future highway systems will now allow the department to efficiently determine future relocation turnback candidates.

For example, one might question the justification for keeping sections of M-37 on the trunkline system after the proposed US-31 and US-131 freeways are opened. Using the statewide traffic forecasting model the analyst will discover significant changes in the 1995 assignment volumes for the "sample study link" from the base year network, Figure 8, to the 1995 network, Figure 9. The trip length frequency distribution diagrams for the same section of M-37 also show a marked change in the distribution of trip lengths or travel characteristics from the 1995 assignment on the base year network, Figure 10, and on the 1995 network, Figure 11. Note the statistical measurements and summaries which appear at the bottom of the diagrams for further comparison.

The relocation turnback process uses the statewide traffic forecasting model as the basic system evaluation tool. Input data would be population projections for the 547 zone statewide model for the year the relocated facility is to be opened to traffic. Output is in the form of computer plots which reflect traffic not only on the proposed new facility but also on sections of the trunkline proposed for turnback. If desired,

The following (2) Figures show the marked difference in traffic volumes assigned by the model comparing BEFORE Figure 8, and AFTER US-31, US-131 freeways are added Figure 9. The base year (1965) ADT's appear above each link and the respective 1995 assigned volumes below the link.

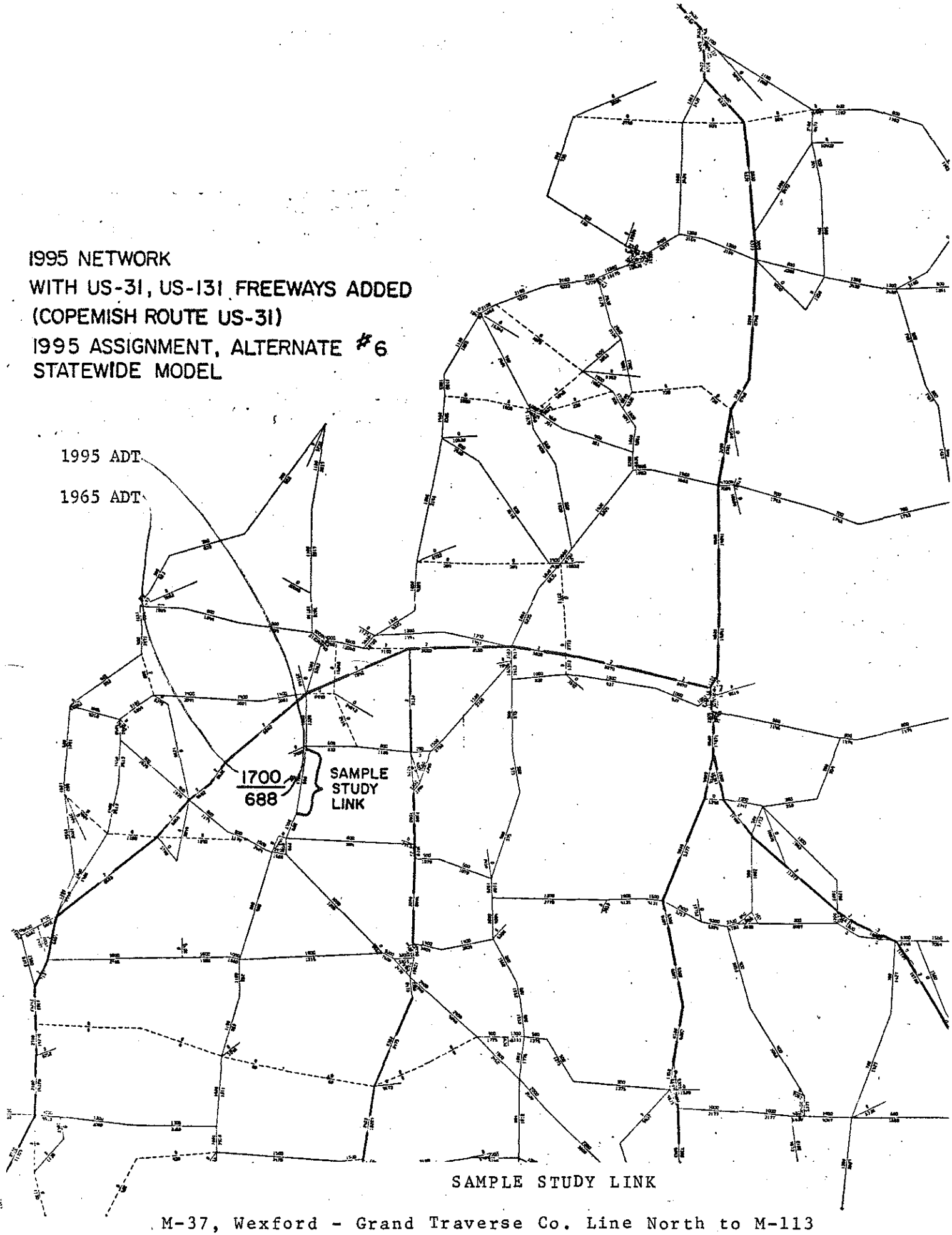




SAMPLE STUDY LINK

M-37, Wexford - Grand Traverse Co. Line North to M-113

FIGURE 8



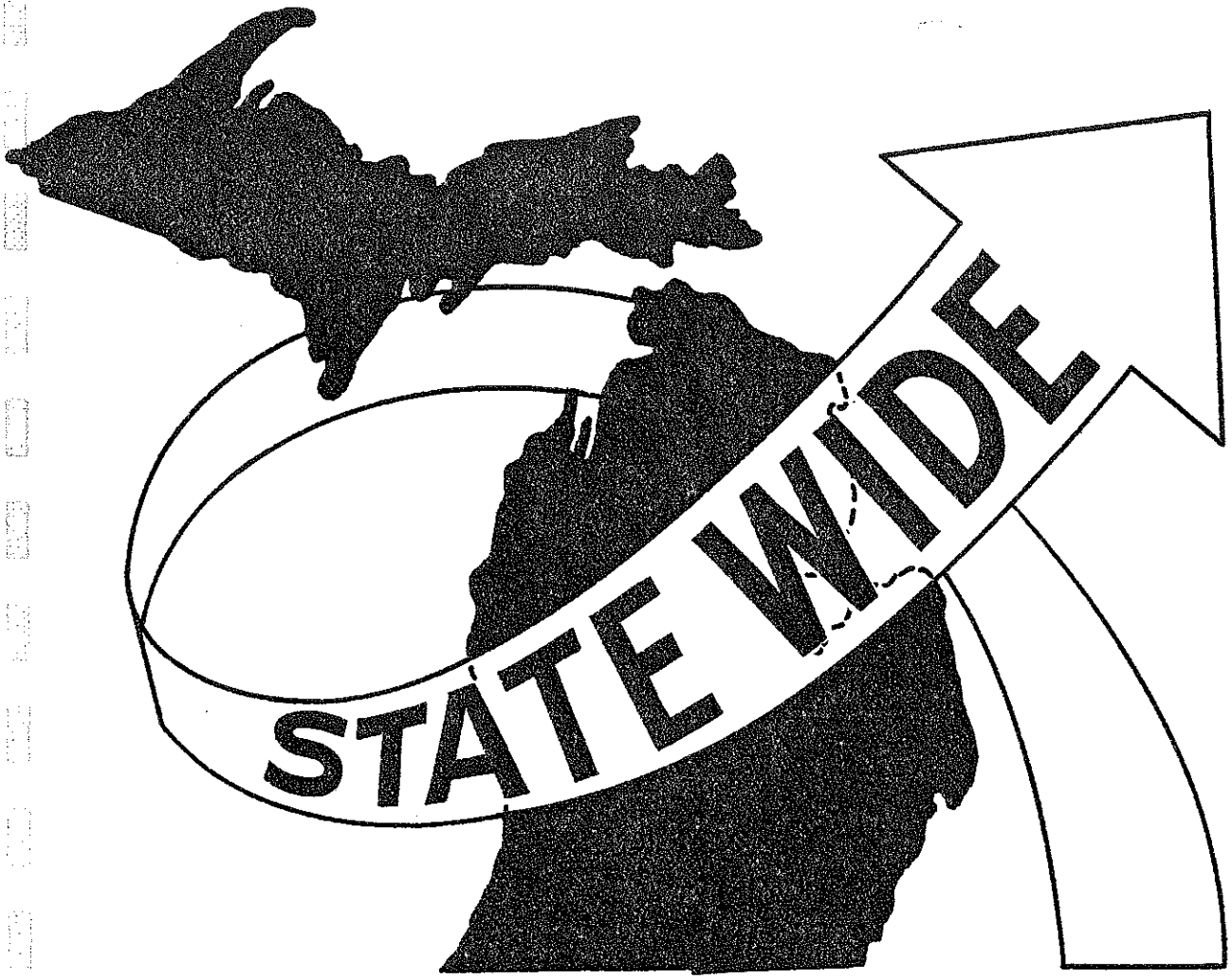
SAMPLE STUDY LINK

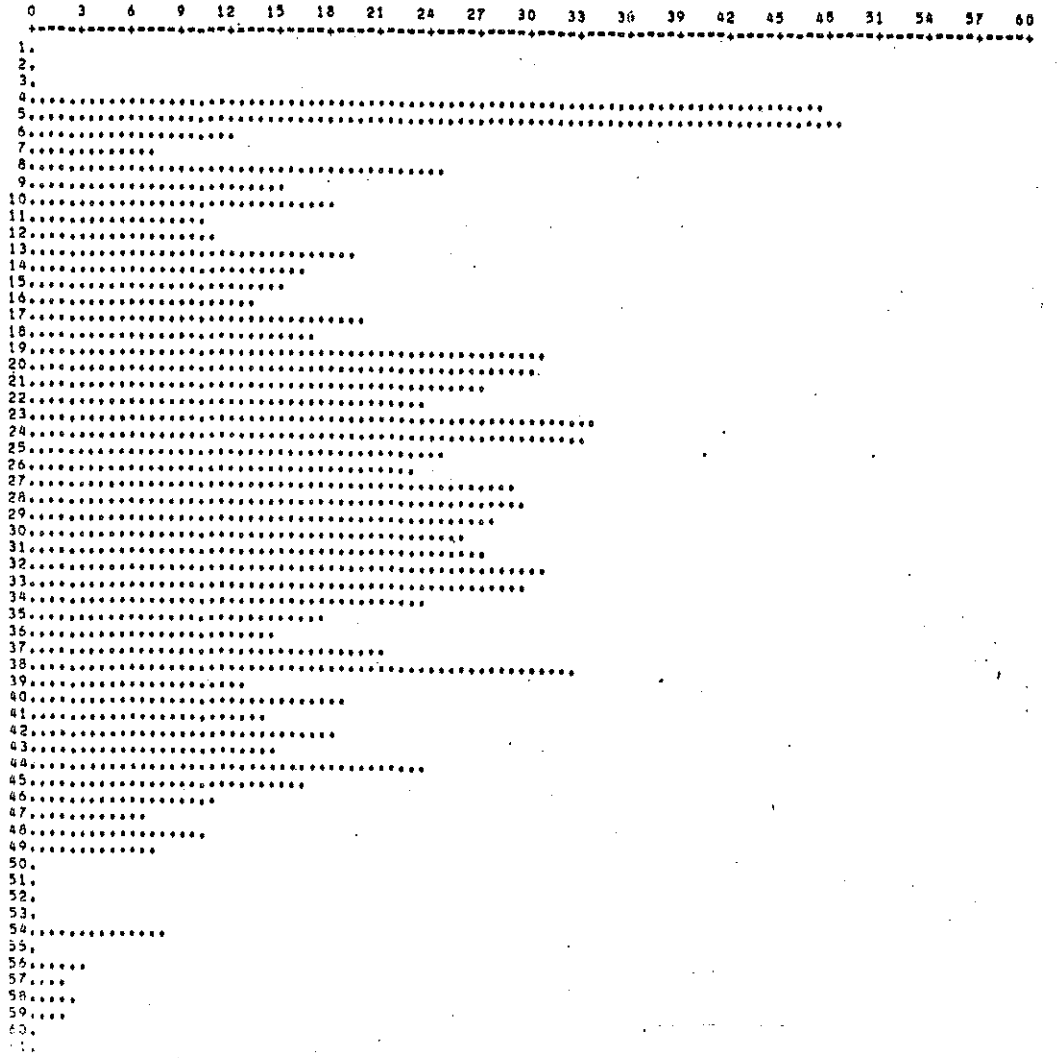
M-37, Wexford - Grand Traverse Co. Line North to M-113

FIGURE 9

The following (2) diagrams show the pronounced changes in the length and frequency of trips which can be expected on the "SAMPLE STUDY LINK" BEFORE and AFTER US-31, US-131 freeways are opened to traffic.

> Note: Program options also permit the plotting of trip length-frequency distribution diagrams using distance rather than time (along the minimum time path). Using the distance as "trip length", the vertical axis and the statistical summaries, such as the mean, would represent miles rather than minutes.





	P.C.	CUM.	ACTUAL
1.	0.000	0.000	0
2.	0.000	0.000	0
3.	0.000	0.000	0
4.	4.715	4.715	144933
5.	4.867	9.581	149604
6.	1.225	10.806	37662
7.	0.733	11.539	22529
8.	2.439	13.978	74968
9.	1.476	15.454	45360
10.	1.794	17.248	55157
11.	1.028	18.275	31591
12.	1.053	19.329	32385
13.	1.896	21.227	58357
14.	1.634	22.861	50230
15.	1.510	24.372	46431
16.	1.322	25.694	40638
17.	1.980	27.674	60877
18.	1.686	29.360	51822
19.	3.076	32.435	94555
20.	3.001	35.436	92252
21.	2.678	38.114	82312
22.	2.320	40.434	71321
23.	3.380	43.814	103901
24.	3.278	47.092	100767
25.	2.474	49.566	76046
26.	2.285	51.851	70248
27.	2.892	54.742	88892
28.	2.951	57.694	90719
29.	2.781	60.474	85477
30.	2.563	63.037	78774
31.	2.717	65.753	83513
32.	3.032	68.785	93197
33.	2.963	71.748	91098
34.	2.316	74.064	71199
35.	1.763	75.827	54188
36.	1.429	77.257	43942
37.	2.087	79.343	64147
38.	3.238	82.581	99528
39.	1.237	83.818	38019
40.	1.870	85.687	57475
41.	1.384	87.072	42556
42.	1.821	88.893	55994
43.	1.454	90.347	44690
44.	2.349	92.696	72213
45.	1.627	94.323	50023
46.	1.085	95.408	33341
47.	0.644	96.052	19795
48.	1.009	97.061	31029
49.	0.707	97.768	21727
50.	0.000	97.768	0
51.	0.000	97.768	0
52.	0.000	97.768	0
53.	0.023	97.791	721
54.	0.780	98.572	23989
55.	0.000	98.572	0
56.	0.301	98.873	9254
57.	0.194	99.066	5954
58.	0.232	99.298	7128
59.	0.177	99.475	5437
60.	0.000	99.475	0
61.	0.000	99.475	0
62.	0.000	99.475	0
63.	0.000	99.475	0
64.	0.009	99.484	274
65.	0.263	99.747	8075
66.	0.033	99.780	1008
67.	0.070	99.849	2148
68.	0.065	99.915	2010
69.	0.085	100.000	2619

REMAINING VALUES ARE ALL ZERO
NUMBER OF OBSERVATIONS= 3071099 SUM= 78914842. MEAN= 25.671 VAR= 174.626 SD= 13.215

TOTAL TRIPS OVER MAXP = 0
TOTAL TRIPS OVER 255 = 0
VOLUME TABLE NUMBER = 201
SKIM TREE NUMBER = 101

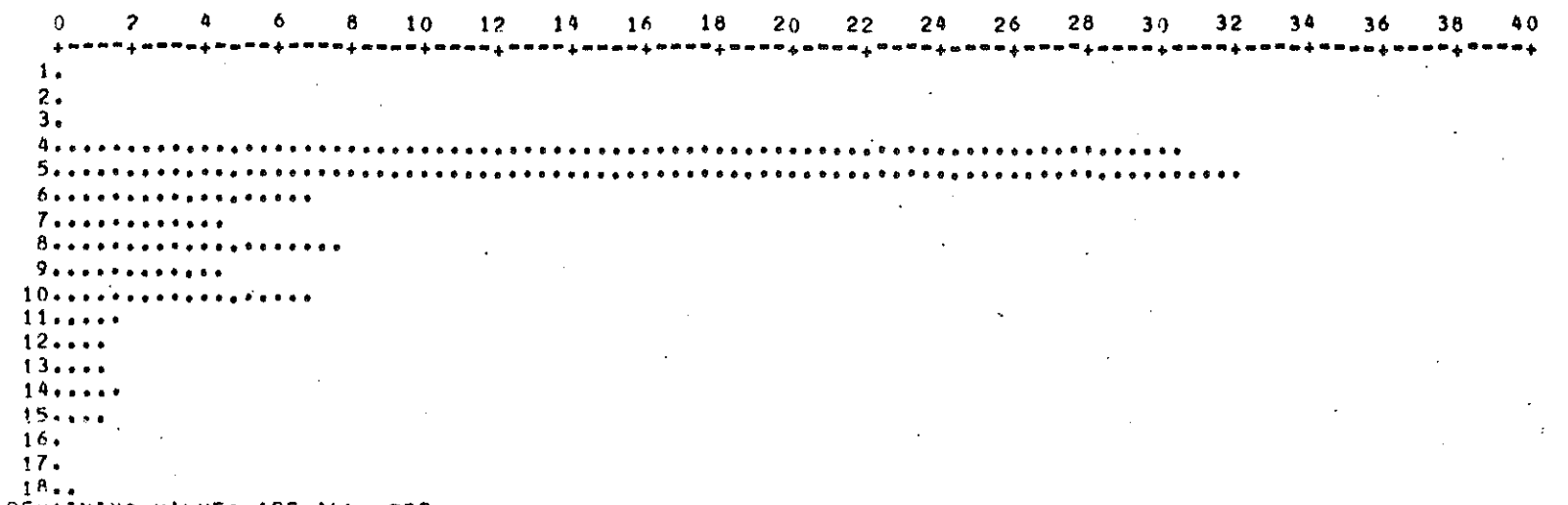
NOTE:

The vertical axis represents travel time grouped in tens of minutes. The horizontal axis is the percent of trips traveling this length of time. The more precise percent (to the thousandths) is listed in the column headed "P.C.". The cumulative percentage of trips is listed in the column headed "CUM.".

Actual numbers of simulated trips are to the thousandth of a trip under "ACTUAL".

TRIP LENGTH FREQUENCY DISTRIBUTION ON M-37 UNDER THE FOLLOWING ASSUMPTIONS:

1. BASE YEAR (1965) NETWORK
2. 1995 ASSIGNMENT



	P.C.	CUM.	ACTUAL
1.	0.000	0.000	0
2.	0.000	0.000	0
3.	0.000	0.000	0
4.	30.357	30.357	134873
5.	32.154	62.511	142853
6.	6.852	69.363	30442
7.	4.520	73.883	20081
8.	7.661	81.544	34035
9.	4.457	86.001	19802
10.	6.894	92.894	30628
11.	1.406	94.301	6248
12.	1.335	95.635	5930
13.	1.068	96.703	4743
14.	1.570	98.273	6974
15.	1.051	99.323	4668
16.	0.177	99.501	788
17.	0.195	99.696	867
18..	0.304	100.000	1351

REMAINING VALUES ARE ALL ZERO
NUMBER OF OBSERVATIONS= 444283 SUM= 2754622. MEAN= 6.200 VAR= 7.414 SD= 2.723

TOTAL TRIPS OVER MAXP = 0
TOTAL TRIPS OVER 255 = 0
VOLUME TABLE NUMBER = 201
SKIM TREE NUMBER = 101

NOTE:

The vertical axis represents travel time grouped in tens of minutes. The horizontal axis is the percent of trips traveling this length of time. The more precise percent (to the thousandths) is listed in the column headed "P.C.". The cumulative percentage of trips is listed in the column headed "CUM.". Actual numbers of simulated trips are to the thousandth of a trip under "ACTUAL".

TRIP LENGTH FREQUENCY DISTRIBUTION ON M-37 UNDER THE FOLLOWING ASSUMPTIONS:

1. 1995 NETWORK
2. WITH US-31, US-131 FREEWAYS ADDED (COPEMISH ROUTE US-31)
3. 1995 ASSIGNMENT

FIGURE 11

a travel-characteristics analysis diagram can be produced for any section of the turnback. This, again, is a graphic display which will allow the user instant access to travel information. This detailed travel characteristics analysis information generally costs the Department almost nothing in manpower as it is automatic output from the modeling process. Only a matter of 20-30 man-minutes were required to obtain the information for the M-37 test.

The above mentioned analysis process is accomplished with minimal human-induced error, maximum computerized expediency and extremely low cost when compared to existing manual techniques. This process also allows the department to spend more time on analysis and much less time on data manipulation.